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# The Importance of Gender and Readiness to Change in the Prediction of Drinking and Negative Consequences of First-Year Student Drinkers

Margot E. Ackermann  
*Old Dominion University*

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**THE IMPORTANCE OF GENDER AND READINESS TO CHANGE IN THE  
PREDICTION OF DRINKING AND NEGATIVE CONSEQUENCES OF  
FIRST-YEAR STUDENT DRINKERS**

by

Margot E. Ackermann  
B.A. May 1988, Wake Forest University  
M.A. July 1991, University of North Carolina at Wilmington  
M.S. August 2004, Old Dominion University

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DOCTOR OF PHILOSOPHY

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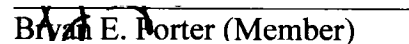
OLD DOMINION UNIVERSITY  
August 2007

Approved by:

  
Jennifer Ann Morrow (Director)

  
Valerian J. Derlega (Member)

  
James Alan Neff (Member)

  
Bryan E. Porter (Member)

## **ABSTRACT**

### **THE IMPORTANCE OF GENDER AND READINESS TO CHANGE IN THE PREDICTION OF DRINKING AND NEGATIVE CONSEQUENCES OF FIRST-YEAR STUDENT DRINKERS**

Margot E. Ackermann  
Old Dominion University, 2007  
Director: Dr. Jennifer Ann Morrow

College drinking is widespread, and binge drinkers can experience serious consequences. The present study examined the effectiveness of two interventions, expressive writing and behavioral monitoring, as well a combined condition, in reducing drinking and negative consequences associated with drinking. Gender differences and differences in readiness to change binge drinking were also assessed. Participants (N = 97) completed a pretest, eight weekly intervention activities, and a posttest during their first semester of college. An ANOVA tested the hypothesis that individuals higher in readiness to change binge drinking participated in more of the weekly intervention activities; this hypothesis was not supported. A series of multiple regressions examined the hypotheses that after controlling for negative consequences, readiness to change and gender would be related to typical drinking (average and heavy) at pretest and posttest. Negative consequences and being in precontemplation predicted pretest drinking, and being in precontemplation predicted posttest drinking. A series of mixed randomized-repeated measures ANOVAs assessed whether typical drinking (average and heavy) and negative consequences changed from pretest to posttest based on intervention group, gender, and readiness to change binge drinking. While the main hypotheses were not supported, results revealed that drinking remained the same from pretest to posttest;

males reported more drinking than females; individuals in precontemplation tended to report the most drinking and negative consequences; and overall, negative consequences from drinking increased from pretest to posttest. A hierarchical linear model (ef) was tested using pretest readiness to change, gender, and intervention condition to predict drinking over the eight-week intervention. Males and precontemplators reported the most initial drinking. Over time, participants in the expressive writing condition tended to increase their drinking over the course of the semester, while males in the monitoring condition tended to decrease their drinking. The present study contributes a greater understanding of readiness to change binge drinking and an assessment of the interventions' ability to reduce drinking and negative consequences among first-year students. The findings will help researchers identify individuals interested in reducing their binge drinking and will be of interest to college personnel who desire to address college drinking early in students' college experience.

This dissertation is dedicated to the memory of Taz, who saw me through most of graduate school but couldn't stay for the end.

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## CHAPTER I

### INTRODUCTION

#### *Overview of Problem*

There is no disagreement among large, national studies that a majority of college students drink, and most college drinkers qualify as binge drinkers (i.e., females/males who have at least four/five drinks per occasion). The College Alcohol Study, last conducted in 2001, reported that 80.7% of students had consumed alcohol in the past year (Wechsler, Lee, Nelson, & Kuo, 2002). The 2005 Monitoring the Future results revealed that 67.9% of college students engaged in alcohol use in the past month (Johnston, O'Malley, Bachman, & Schulenberg, 2006). Furthermore, rates of binge drinking are high among college students, with several studies reporting binge drinking rates in the past two weeks of around 40% (O'Malley & Johnston, 2002). Although the rate of binge drinking has remained the same for the past several years (1993-2005), it appears that college students today are binge drinking more often (National Center on Addiction and Substance Abuse at Columbia University, 2007).

Binge drinking is of particular concern among college students because of the serious consequences they may experience: unplanned or unwanted sex, legal problems, and even death (see Perkins, 2002, for a review). Hingson, Heeren, Zakocs, Kopstein, and Wechsler (2002) estimated that there were 1445 alcohol-related deaths among college students in 1998. A related study that compared estimates for 1998 and 2001 revealed an upward trend (a 5% increase) (Hingson, Heeren, Winter, & Wechsler, 2005).

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The model journal used in the preparation of this dissertation was the *Journal of Applied Psychology*.

While most students do not die from their drinking, serious consequences appear to be alarmingly common. Vik, Carello, Tate, and Field's (2000) investigation of binge drinkers found that in the past year, almost one-third of males and one-fifth of females had engaged in unprotected sex as a result of drinking. Over one-half of males and almost one-third of females had been pulled over for suspicion of drunk driving during this time period.

The first year of college is, for many students, a time of new stressors (e.g., changes in housing situations, academic requirements), as well as new-found freedoms (Dill & Henley, 1998; Ross, Niebling, & Heckert, 1999; Towbes & Cohen, 1996). Students are in the midst of establishing new habits, and one of these habits may be binge drinking. Upcraft (2002) suggests that interventions for college drinking need to begin as soon as students set foot on campus. Less experienced drinkers who experience negative consequences seem to be particularly amenable to interventions, perhaps because they are less accustomed to some of the negative consequences associated with drinking and want to avoid them in the future (Barnett, Goldstein, Murphy, Colby, & Monti, 2006). For these reasons, the present study was developed to investigate drinking and negative consequences among first-year students in their initial semester of college.

Of particular interest in this population of first-year students is how their drinking and negative consequences experienced due to drinking change over the course of their first semester of college. Much research suggests that experiencing negative consequences from drinking may help motivate individuals to reduce their drinking (Alexander & Bowen, 2004; Blume, Marlatt, & Schmalting, 2000; Barnett et al., 2006; Blume, Shmalting, & Marlatt, 2006; Vik, Culbertson, & Sellers, 2000). This idea that

people are motivated to change has its roots in the Transtheoretical Model (TTM), which illustrates a process that individuals go through in changing their behavior (Prochaska & Norcross, 2001). In the first stage, *precontemplation*, individuals have no awareness that there is a problem, and they are not thinking about changing their behavior.

*Contemplation* is the next stage, in which individuals consider changing their behavior.

Individuals in contemplation are beginning to see that there are both advantages and disadvantages to changing their behavior. When individuals decide that change is needed, or when the advantages of change outweigh the disadvantages, they are in *preparation*, and they begin taking preliminary steps to initiate change. In *action*, individuals are committed to change and begin to actually change their behavior. Finally, in *maintenance*, individuals work to maintain the change in the lives.

Although the TTM has received a great deal of attention in the literature, it is not clear whether interventions to reduce binge drinking actually increase individuals' motivation to change (Fromme & Corbin, 2004; Vasilaki, Hosier, & Cox, 2006).

Readiness to change has commonly been used to predict the success of an intervention, but it is usually just measured once, even in longitudinal studies. A more complete understanding of whether successful interventions increase readiness to change, or whether readiness to change possibly marks an openness to intervention and willingness to participate, will enable researchers to devise better ways to solve the widespread problems caused by college drinking.

Little emphasis has been placed on gender in investigations of binge drinking among college students, except to note that males tend to drink more and experience more consequences (Benton et al., 2006; Sitharthan, Kavanagh, & Sayer, 1996; Vik,

Culbertson, et al., 2000). Moyer, Finney, Swearingen, and Vergun (2002) noted the likelihood that the effectiveness of interventions might differ based on gender. There is some evidence that suggests that interventions are more effective with heavier drinkers, which brings to light the possibility that the interventions of interest will have a greater impact on males (Murphy et al., 2001).

Therefore, the purpose of the present study is to examine the relationship of readiness to change and gender with drinking and negative consequences during first-year students' initial semester of college. This research has five main objectives: 1) examine whether readiness to change binge drinking is related to participation in the eight-week intervention 2) test whether readiness to change and gender predict changes in drinking or negative consequences from pretest to posttest 4) determine whether negative consequences, readiness to change, and gender predict drinking at pretest and posttest and changes over time 4) evaluate the relative effectiveness of three intervention conditions, and 5) extend previous research by focusing on a population of first-year students. Resulting knowledge will be of interest to college administrators, student services personnel, and health professionals as they seek to develop prevention and intervention approaches for binge drinking early in students' college experience.

## **CHAPTER II**

### **REVIEW OF THE LITERATURE**

Experiencing negative consequences from drinking may motivate individuals to reduce their alcohol consumption (Alexander & Bowen, 2004; Blume et al., 2000; Barnett et al., 2006; Blume et al., 2006; Smith & Tran, 2007; Vik, Culbertson, et al., 2000). Some investigations have found that negative consequences are more related to psychological factors (e.g., negative affect, positive expectancies about the effects of drinking, depression, and anxiety) than to actual drinking amounts (Park & Grant, 2005; Young, Connor, Ricciardelli, & Saunders, 2006). The psychological aspect of negative consequences is important because it suggests that individuals who are experiencing negative consequences from their drinking may be particularly open to interventions. Smith and Tran's (2007) finding that anxiety and depression were associated with greater readiness to change supports this view.

An examination of interventions to reduce college drinking reveals two different perspectives on change. The TTM suggests that individuals decide to change when the benefits of change outweigh the negative aspects of change (Miller & Rollnick, 2002). This weighing of the costs and benefits of change is termed the decisional balance. An intervention based on the TTM, motivational interviewing, seeks to increase individuals' readiness to change, and one way in which change might be motivated is through an individual's examination of negative consequences. A contrasting perspective that has informed interventions for college drinking is that change occurs when individuals no longer have a reason to drink. Alcohol expectancies, or the beliefs that individuals hold about the outcomes they will experience from drinking, appear to influence the amount



that individuals drink (Armeli et al., 2005; Park & Grant, 2005); however, positive expectancies of alcohol use are a stronger predictor of negative consequences than they are of drinking amounts (Young et al., 2006). Drinking motives are similar to expectancies in that they address why students drink, but they are assessed by asking individuals why they drink, rather than by focusing on what they expect to happen when they drink (Neighbors, Larimer, & Lewis, 2004). Cooper (1994) identified four reasons that individuals drink: to cope, to conform, to have a good time, and to help them socialize with others. Individuals who drink to cope or conform tend to experience the most negative consequences (Cooper, 1994).

In spite of the differences between these two perspectives, a comparison of the decisional balance from the TTM and positive and negative alcohol expectancies found that in practice, these two views are similar (Noar, LaForge, Maddock, & Wood, 2003). Positive and negative expectancies predicted measures of drinking quantity and frequency, as did reasons to continue drinking and reasons to stop or reduce drinking from the decisional balance. This finding suggests that interventions to reduce student drinking work in similar ways. It also highlights the potential usefulness of assessing readiness to change in interventions that are not motivational (i.e., designed to increase readiness to change) in nature.

The threat of experiencing negative consequences due to drinking is clearly not enough to facilitate widespread reductions in binge drinking (National Center on Addiction and Substance Abuse at Columbia University, 2007). There is a need for additional research and new approaches that can reach large numbers of students (Task Force, 2002). The present research examines two interventions for binge drinking,

behavioral monitoring and expressive writing. Following a discussion of negative consequences and readiness to change, gender differences in drinking and consequences are reviewed. Literature on behavioral monitoring and expressive writing interventions, which are of particular interest in the present study, are also discussed.

### *Do Negative Consequences Motivate People to Change?*

The picture that emerges from studies of readiness to change among college drinkers suggests that as students experience greater negative consequences, their desire to change their behavior increases (McNally & Palfai, 2001). Students classified in the precontemplation stage of change appear to be at the lowest risk for alcohol problems in that they tend to drink the least and experience the fewest negative consequences (Thombs & Briddick, 2000; Vik, Culbertson, et al., 2000). Contemplators tend to drink more and experience more negative consequences than individuals who are in precontemplation, and the consequences that they experience appear to be the most serious (Caldwell, 2002; Thombs & Briddick, 2000; Vik, Culbertson, et al., 2000). Individuals in the action stage reported similar negative consequences to those in contemplation, perhaps suggesting that it was these consequences that motivated them to take steps to reduce their drinking (Vik, Culbertson, et al., 2000). Overall, individuals in later stages of change appear to experience greater negative consequences (McNally & Palfai, 2001), and individuals who perceive that the consequences are most unpleasant also report the highest readiness to change (Barnett et al., 2006).

A similarity among measures of readiness to change is that most are designed to assess readiness to change drinking in general, rather than binge drinking [e.g., Heather, Gold, & Rollnick's (1991) Readiness to Change Questionnaire (RTCQ); McConaughy,

Prochaska, & Velicer's (1983) University of Rhode Island Change Assessment (URICA); and Miller & Tonigan's (1996) Stages of Change Readiness and Treatment Eagerness (SOCRATES) scale]. In other words, it is possible that individuals may be determined to reduce their drinking, but they may not be considering a reduction below binge levels. Because binge drinking is of primary concern and students who drink at this level are most likely to experience negative consequences, it is important to know who intends to continue or cease binge drinking (Wechsler, Dowdall, Davenport, & Rimm, 1995). Barnett et al.'s (2006) research revealed that among students who were referred due to medical or disciplinary incidents, the intention to change binge drinking is different from the intention to change drinking in general. Examining differences between participants in precontemplation vs. contemplation, preparation, and action stages (for reducing binge drinking), the researchers found that those who reported the lowest alcohol consumption and fewest negative consequences were most likely to be considering decreasing their binge drinking. This is exactly the opposite of what has been suggested by research that looks at readiness to change drinking.

In intervention research with college students, participants are usually qualified by having gotten into trouble for their drinking (e.g., Caldwell, 2002), needing medical treatment for their drinking, drinking a certain amount or at a certain frequency (e.g., Blume et al., 2000; Chiauzzi, Green, Lord, Thum, & Goldstein, 2005; McNally & Palfai, 2001; Palfai, McNally, & Roy, 2002; Thombs & Briddick, 2000; Vik, Culbertson, et al., 2000), or some combination of these criteria (e.g., Barnett et al., 2006; Fromme & Corbin, 2004). This aspect of sampling suggests that many individuals who are prepared to reduce their binge drinking do not get the treatment or help they need or would be

willing to take. The drinkers in the Barnett et al. (2006) study were selected based on their need for medical treatment due to drinking or an encounter with campus or local authorities. However, it is likely that many drinkers higher in readiness to change binge drinking (who are drinking less and experiencing fewer consequences) do not have such encounters. The timeframe of past week's binge drinking in the Chiauzzi et al. (2005) study would also potentially miss some of these individuals. Moreover, Barnett et al. (2006) suggest that individuals at lower levels of drinking are most likely to be shocked by negative consequences. Because they are less used to them, they possibly find them more unpleasant and perceive the consequences as a call to change their drinking. Therefore, it is likely that first-year students who have less experience drinking and are less accustomed to experiencing negative consequences from drinking constitute a large part of this missed opportunity.

#### *Gender Differences in Drinking and Negative Consequences*

Men tend to drink more and experience more problems (and more serious problems) than do women (Benton et al., 2006; Sitharthan et al., 1996; Vik, Culbertson, et al., 2000). Vik, Culbertson, et al. (2000) categorized consequences along a continuum of careless behavior (e.g., missing class, getting injured) to reckless behavior (e.g., having unplanned or unprotected sex) to authority problems (e.g., getting in trouble with law enforcement). While 96.9% of males reported experiencing careless consequences, 89.1% of females reported them. Just under one-fourth (73.0%) of males reported reckless consequences, compared to less than half of females (49.2%). The proportion of males who experienced problems with authority (45.3%) was even greater in comparison to females, with just 24.0% of females reporting them. Because women are less likely to

experience serious consequences, when they do, they may find them even more unpleasant and be more likely to consider reducing their drinking (Barnett et al., 2006).

While there do not appear to be general gender differences in readiness to change, research suggests that the way in which males and females experience serious consequences is different. Females who experience serious consequences from drinking are most likely to contemplate a reduction in their drinking. Vik, Carrello, et al. (2000) did not find differences in readiness to change among male and female binge drinking college students. It is important to note that the researchers did not examine whether there were gender differences in the consequences students experienced. It seems likely, based on a previous study that assessed the percentage of male and female binge drinkers who experienced negative consequences from their drinking, that the consequences experienced by males and females differed in their intensity (Vik, Culbertson, et al., 2000).

In addition, it has been suggested that males and females may respond differently to interventions, with some interventions being more effective with one gender (Moyer et al., 2002). Although Murphy et al. (2001) did not focus on gender in their assessment of a brief (50 minute) intervention, their finding that the intervention had the most impact among the heaviest drinkers suggests that the intervention may work best with males, who tend to drink more than females. The rationale for potential gender differences is further elaborated on in discussions of the interventions of interest.

#### *Deficiencies in the Literature Regarding Readiness to Change and Drinking*

Although a number of studies have investigated readiness to change among college students, fewer have focused on readiness to change binge drinking. Barnett et

al.'s (2006) study found that individuals higher in readiness to change binge drinking were actually lighter drinkers who experienced fewer consequences, which is the opposite of what has been found in the literature on readiness to change drinking.

Fromme and Corbin (2004) noted that little research has examined whether interventions for excessive drinking have actually increased participants' readiness to change. The researchers found little support for this in their assessment of the Lifestyle Management Class intervention for drinkers, which was based upon the idea of increasing readiness to change. However, participants higher in readiness to change responded more positively to interventions by reducing their drinking the most (Fromme & Corbin, 2004). In Heather, Rollnick, and Bell's (1993) validation of the Readiness to Change Questionnaire, the researchers found that stage of change was predictive of future drinking, with participants in the action stage (vs. precontemplation, contemplation, and preparation) drinking less at follow-up. On the other hand, Sitharthan et al. (2006) found that over a four-month intervention, participants' readiness to change increased. Whether readiness to change marks an openness to intervention and willingness to participate [as suggested by the name of Miller and Tonigan's (1996) measure, the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES)] is certainly one area of importance in future research. It is important to understand whether individuals who are not considering changes in their drinking are willing to consider participating in research or interventions designed to reduce binge drinking.

The present study helps fill these gaps in the literature by using a measure designed to assess whether students intend to change their binge drinking. In this way, the research will be able to differentiate students who are willing to reduce their drinking

to levels that are of less concern. In addition, the study contributes to the literature by examining whether readiness to change is related to adherence to one of the research protocols. Finally, this study extends the literature by focusing on a sample of first-year students during their first semester of college. These students are of particular interest because they have not become accustomed to heavy drinking in the college environment, and intervening early may prevent future negative consequences from occurring (Upcraft, 2002).

### *Behavioral Monitoring as an Intervention for College Drinking*

Behavioral monitoring interventions involve having individuals keep track of their drinking. Considered a form of cognitive-behavioral intervention, this method has not been widely used with college students (Task Force, 2002). However, this method is sometimes employed in longitudinal research in the form of a control group on which only information about drinking habits is collected (Larimer & Cronce, 2002). Sitharthan et al. (1996) found that among individuals who agreed to participate in a mail-based intervention, even those assigned to a condition in which they were only provided with educational materials about the effects of alcohol and asked to complete baseline and follow-up measures of their drinking reduced their drinking, though not as much as those involved in the experimental condition. Collins and colleagues (Collins, Morsheimer, Shiffman, Paty, Gnys, & Papandonatos, 1998) also revealed declines in drinking among control group members who had been solicited with ads targeted towards individuals who were interested in reducing their drinking. These changes in drinking may be due to measurement reactivity, in which measurement of drinking may contribute to awareness and reduction of the problem; it is also possible that one reason that behavioral

monitoring might work rests partially on the fact that once individuals have agreed to participate in an intervention, they have already decided to change (Collins et al., 1998; Epstein, Drapkin, Yusko, Cook, McCrady, & Jenson, 2005; Kypri, Langley, Saunders, & Cashell-Smith, 2006; Sitharthan et al., 1996).

In a behavioral monitoring intervention with college males, Garvin, Alcorn, and Faulkner (1990) reported that students who monitored their drinking by keeping a daily diary consumed less alcohol on average than students who received education about the effects of alcohol and another group that received guidance on how to control their drinking. Cronin (1996) did not find a difference in student drinking using a similar technique in which one group of students predicted how much they would drink during the week of spring break. After spring break, the students who predicted their drinking and a posttest-only control group reported similar drinking. However, the negative consequences of drinking were lower for the students who recorded how much they thought they would drink in the future.

A more recent study suggests that behavioral monitoring may be more effective for females than for males (Agostinelli, Floyd, Grube, Woodall, & Miller, 2004). College students were asked to report on their annual drinking, a typical week's drinking, and how many times they had more than five drinks per occasion during the past two weeks. They were also asked to estimate typical drinking (annual, average, and heavy) for typical students. While males typically drank more and recognized that their drinking might be problematic, the relationship between females' reported rates of drinking were more associated with their levels of problem recognition. Agostinelli et al. (2004) suggest that this gender difference may be based in different norms for males and



females, with females seeing heavy drinking as less acceptable. For this reason, it is expected that behavioral monitoring of drinking will have the greatest impact on females.

Although research in this area is limited, similar techniques are worth investigating further, as they are easy and inexpensive to implement, and a wide audience can be reached through the use of the Internet. Expressive writing, discussed next, shares some of the positive characteristics of behavioral monitoring in that it can easily be adapted to online use.

### *Expressive Writing's Potential to Reduce Binge Drinking*

In Pennebaker and Beall's (1986) original expressive writing study, participants were given instructions to write for 15 minutes per day for four days in a quiet place about "a personally upsetting experience" (p. 275). The focus of this research was on healthcare utilization by students. With three writing groups (one that focused on emotions associated with the upsetting experience, another that focused on the facts of the experience, and a combined group that wrote about both facts and emotions) and a control group, the researchers found that those in the combination condition had fewer visits to the university health center for the six months following the study. An assessment of several health behaviors (e.g., use of alcohol, caffeine, and tobacco) revealed no differences among the expressive writing and control groups. However, samples sizes in the four conditions ranged from 11-12, making power an issue, and detailed results were not provided to form an opinion of the practical significance of any differences.

Although Pennebaker's original study has generated a large volume of research, expressive writing's effect on drinking has rarely been examined in the literature. No

studies have specifically focused on drinking, though a few have measured drinking (i.e., Pennebaker, Colder, & Sharp, 1990; Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Spera, Burhfeind, & Pennebaker, 1994). Spera and colleagues (1994) found that among individuals who had lost their jobs, those in the expressive writing condition reported less drinking than those in the control condition. Studies by Pennebaker and colleagues (Pennebaker et al., 1998; Pennebaker et al., 1990) have indicated that there were no differences in drinking between writing and control groups. However, descriptions of how drinking was measured in these studies is unclear.

Several meta-analyses have attempted to quantify the effects of expressive writing (Frattaroli, 2006; Frisina, Borod, & Lepore, 2004; Smyth, 1998). None have concluded that expressive writing has a positive impact on health behaviors. Both Smyth (1998) and Frattaroli (2006) in their meta-analyses explained the non-significant findings of interventions addressing health behaviors (e.g., smoking and drinking) by suggesting that changing an individual's emotional state is unlikely to change the behavior. Smyth suggested that "Health behaviors would ... seem to be more influenced by commitment than by emotional factors" (p. 181). Frattaroli seconded this view, noting that "health behavior change may be more dependent on cognitive factors than on emotional factors" (p. 853). One question that has not been addressed is whether people who are contemplating health behavior change can be aided by expressive writing. In particular, assessing readiness to change in the context of an expressive writing intervention would provide insight into whether expressive writing can help people who have a desire to change their behavior.

Although expressive writing has not been shown to reduce drinking among college students, it has been effective in improving their psychological health. For example, participants in expressive writing interventions have shown reduced depression (Gortner, Rude, & Pennebaker, 2006; Lepore, 1997) and intrusive thoughts (Lepore, 1997). In addition, expressive writing has resulted in improved working memory (Klein & Boals, 2001). Klein (2002) has proposed a model in which expressive writing helps organize memories of stressful experiences, resulting in fewer intrusive thoughts and improved coping.

Drinking to cope appears to be quite common among college students, and individuals who drink to deal with stress tend to report both greater drinking and more negative consequences (Park & Levenson, 2002). As previously mentioned, individuals with poor psychological functioning appear to experience greater negative consequences of drinking (Fenzel, 2005; Park & Grant, 2005, Young et al., 2006), so it is likely that an expressive writing intervention can reduce negative consequences, even if there are no associated changes in drinking.

It is also possible that expressive writing is more effective with males, given Smyth's (1998) finding that that studies with larger proportions of males tended to have larger effect sizes. In addition, the relationship between stress and drinking appears to be stronger for males than it is for females (Dawson, Grant, & Ruan, 2005; Yeh, Chiang, & Huang, 2006). The fact that males tend to drink more and at least one intervention has been shown to be more effective with heavier drinkers (e.g., Murphy et al., 2001) suggests that males will be more responsive to expressive writing than females.

Neither readiness to change nor the negative consequences of drinking have been assessed in expressive writing interventions. Given the complexity of behavior change, a better understanding of readiness to change in expressive writing interventions will provide a deeper understanding of whether and for whom the intervention works.

### *The Present Study*

The present study was designed to examine the ability of behavioral monitoring and expressive writing to reduce drinking and negative consequences among students in their first semester of college. Readiness to change has not been examined specifically with first-year students in their first semester of college, which is unexpected because a number of students begin drinking or increase their drinking in college (Leeman & Wapner, 2001; Reifman & Watson, 2003). By intervening early, researchers may be able to prevent students from experiencing serious consequences.

These interventions were selected because they can both be distributed through the Internet and are low-cost and easily scaled in size and to different populations. In addition to testing the interventions with a targeted population of first-year students, readiness to change is of central interest of this research because it is believed that a better understanding of the role of readiness to change will further the design of widespread prevention and intervention techniques.

### *Hypotheses*

The present study examines whether readiness to change binge drinking is related adherence in an eight-week intervention, along with how it relates to average and heavy drinking when students first come to college. How does student drinking change over time? In addition, this study provides an analysis of whether three intervention

conditions and individuals in different stages of change differ in their pretest and posttest measures drinking and negative consequences. Due to gender differences in drinking and negative consequences found in previous research, gender differences are also examined. Specifically, the following hypotheses will be tested among participants:

1. Readiness to change at pretest predicts participation in the eight-week intervention period. Binge drinkers in precontemplation and nonbinge drinkers are expected to have lower rates of participation in the weekly activities than binge drinkers in contemplation, preparation, action, and maintenance. This hypothesis was tested using ANOVA with three groups: nonbinge drinkers, binge drinkers in precontemplation, and binge drinkers in later stages of change (i.e., contemplation, preparation, action, and maintenance).
2. After controlling for negative consequences, readiness to change at pretest and gender are related to average drinking and typical heavy drinking at pretest and posttest. Individuals in precontemplation and males are expected to report more drinking and heavy drinking at the pretest and posttest. This hypothesis was tested using two hierarchical multiple regressions with RAPI scores partialled out in the first step and two standard multiple regressions. Note that in the standard multiple regressions, RAPI scores were not sufficiently correlated with the dependent variables to justify inclusion in the analyses.
3. Changes in average drinks, heavy drinks, and negative consequences from pretest to posttest differ based gender, intervention group, and readiness to change. Males, individuals in the expressive writing and monitoring condition, and participants in contemplation, preparation, action, and maintenance (as a group)

are expected to exhibit the largest decreases in average drinks, heavy drinks, and negative consequences from pretest to posttest. This hypothesis was tested using nine mixed randomized-repeated measures ANOVAs with time as the repeated independent variable.

4. Baseline readiness to change, gender, and intervention condition predict drinking over time. Individuals higher in readiness to change (i.e., those in the contemplation, preparation, action, and maintenance group), males, and those in the EWM condition are expected to reduce their drinking the most over time. This hypothesis was tested using a hierarchical linear model (HLM).

## CHAPTER III

### METHOD

#### *Participants*

A part of a larger data collection effort in which participants had to be at least 18 years old, in order to participate in the present study, participants also had to have completed the pretest, participated in at least one of the weekly intervention activities (and reported having at least one drink), and completed the posttest. Of 231 first-year college students randomly assigned to one of the three intervention conditions, 42.4% ( $N = 98$ ) did not report any drinking during the eight-week intervention period and were not included in the present study. Of the 133 potential participants, 36 did not complete pretest, intervention, and posttest data necessary for inclusion in the study. The final sample included 97 first-year student drinkers at a large, public university in the southeast.

Of these individuals, 70.1% were White, 15.5% were Black, 9.3% were multiracial, 4.1% were Asian, and 1.0% reported their race/ethnicity as other. A vast majority (87.5%) of participants were 18 years old at the beginning of the study, with an average age of 18.21 ( $SD = .66$ ). Most reported that they lived in an on-campus residence (64.9%) or with their parents (22.7%). Refer to Table 1 for additional demographic information on participants.

The university's Institutional Review Board approved the study, and all requirements for the treatment of human subjects were followed. Students were informed of their right to withdraw from the study at any time, and they were provided with information about the potential costs and benefits of their participation prior to accessing

Table 1

*Demographic Characteristics of Participants by Group (N = 97)*

	Expressive Writing (N = 32)	Behavioral Monitoring (N = 37)	Expressive Writing + Behavioral Monitoring (N = 28)	Total (N = 97)
<b>Gender</b>				
Male	5 (15.6%)	10 (27.0%)	6 (21.4%)	21 (21.6%)
Female	27 (84.4%)	27 (73.0%)	22 (78.6%)	76 (78.4%)
<b>Race</b>				
White	21 (65.6%)	27 (73.0%)	20 (71.4%)	68 (70.1%)
Black	6 (18.8%)	5 (13.5%)	4 (14.3%)	15 (15.5%)
Multiracial	3 (9.4%)	3 (8.1%)	3 (10.7%)	9 (9.3%)
Asian	2 (6.3%)	2 (5.4%)	0	4 (4.1%)
Other	0	0	1 (3.6%)	1 (1.0%)



Table 1, continued

Housing status

On-campus residence hall	21 (65.6%)	23 (62.2%)	19 (67.9%)	63 (64.9%)
Off-campus university housing	1 (3.1%)	0	1 (3.6%)	2 (2.1%)
Off-campus w/o parents	5 (15.6%)	4 (20.8%)	1 (3.6%)	10 (10.3%)
With parents	5 (15.6%)	10 (27.0%)	7 (25.0%)	22 (22.7%)

Relationship status

Single	14 (43.8%)	20 (54.1%)	15 (53.6%)	49 (50.5%)
Single but committed	18 (56.3%)	16 (43.2%)	12 (42.9%)	46 (47.4%)
Living with partner	0	1 (2.7%)	1 (3.6%)	2 (2.1%)

Table 1, continued

College major

Arts & Letters	12 (37.5%)	3 (8.1%)	11 (39.3%)	26 (26.8%)
Business & Public Admin	1 (3.1%)	6 (16.2%)	1 (3.6%)	8 (8.2%)
Education	1 (3.1%)	2 (5.4%)	1 (3.6%)	4 (4.1%)
Engineering & Technology	6 (18.8%)	4 (10.8%)	4 (14.3%)	8 (8.2%)
Health Sciences	12 (37.5%)	6 (16.2%)	4 (14.3%)	16 (16.5%)
Sciences	0	7 (18.9%)	2 (7.1%)	21 (21.6%)
Undecided	0	9 (24.3%)	5 (17.9%)	14 (14.4%)

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the pretest. In addition, specific measures were taken to maintain anonymity for students. Their contact information was not linked to their data, and a limited number of researchers on the project had access to the unique code used to link individuals with their responses. It was necessary to obtain student contact information due to the nature of the intervention (i.e., an online journal activity); students were informed in the weekly activities that if they threatened to harm themselves or others, the researchers would need to match their unique code with their contact information in order to intervene. A clinical psychologist (Dr. Robin Lewis), the co-primary investigator on the larger project, was available if such intervention became necessary.

#### *Procedure*

At the beginning of the fall semester of 2006, Institutional Research provided the email addresses of incoming first-year students to the researchers. During the first week of the semester, an email was sent to all (approximately 2,000) first-year students requesting that they complete a contact survey if they were interested in participating in a study on stress and drinking among first-year students. This email, the contact survey invitation, appears in Appendix A. Flyers were posted on campus informing students about the study in an additional effort to solicit their participation. Students could respond to the flyer by contacting the researchers, and they were then provided with the online web address for the contact survey. Refer to Appendix B for a copy of the contact survey.

Once participants completed the contact survey, they were invited to complete an online pretest survey. The pretest survey invitation appears in Appendix C. The pretest survey contained demographic questions, as well as measures of typical weekly drinking

(for an average week and a heavy week), negative consequences of drinking, and readiness to change binge drinking. Participants were paid \$10 for participating in the pretest. Refer to Appendix D for the pretest survey.

Participants were then randomly assigned to one of three experimental conditions (expressive writing = EW, behavioral monitoring = MON, and expressive writing + monitoring = EWM). Participants in the three groups were asked to participate in a series of eight weekly activities. They were sent weekly invitations to complete the weekly surveys, and students who did not complete the survey within approximately 48 hours were reminded about the option to take the survey. Each week, students who participated in the intervention were entered into a raffle for a variety of incentive prizes (e.g., MP3 players, jump drives, and gift certificates). Appendices E, F, and G contain examples of the weekly surveys for the EW, MON, and EWM groups, respectively.

In addition to the intervention, participants were invited to take two midpoint surveys (at weeks three and six) along with the intervention activity. If they chose to participate, they were paid \$10 for their participation.

Participants in both the EW and EWM conditions were provided with the following instructions for the expressive writing portion of the intervention.

During your first semester of college, you are being asked to write about your alcohol use and any stressful experiences you have encountered while you are adjusting to college life.

Specifically, we have asked for you to write for at least 20 minutes, once a week for the next eight weeks, about your alcohol use and stressors you have encountered while at college. What we would like you to write about for these writing sessions are your deepest thoughts and feelings about your experiences surrounding your alcohol use and college life.

Everyone adjusts to college differently, and we want to know about how you

personally experience your first semester at Old Dominion University. Whatever you choose to write, it is critical that you really focus on your deepest thoughts and feelings. Ideally, we would like you to focus on feelings, thoughts, or changes that you have not discussed in great detail with others.

The only rule we have is that you write continuously for at least 20 minutes each week. Each week after completing your writing activity, you will fill out a brief questionnaire.

Different people will be asked to write about different topics. Because of this, we ask that you not talk with anyone about the study. Your writing is confidential. We will identify your responses by your unique participant number only (this is a number generated by the survey software – the survey link you receive is unique to each student).

We assure you that none of your writing will be linked to you personally. The one exception is that if what you say indicates that you intend to harm yourself or others, we are legally and ethically bound to match your participant ID with your name. Above all, we want to respect your privacy. If at any time you have questions, you may call the primary researcher, Dr. Jennifer Ann Morrow, at 757-683-4448 or email her ([jmorrow@odu.edu](mailto:jmorrow@odu.edu)).

For the behavioral monitoring portion of the survey, both MON and EWM participants were asked to report details on their drinking (i.e., what they drank, how they obtained alcohol, and whether they thought they had drunk too much).

### *Measures*

At the pretest and posttest, participants completed demographic information (i.e., gender, age, race/ethnicity, relationship status, housing status, and intended major), as well as the following measures.

*Readiness to change.* LaForge, Maddock, and Rossi's (1998) measure of motivation to change heavy drinking requires participants to select one statement out of five that reflects which stage of change they are in. The measure is gender-specific based on Wechsler and colleagues (1995) definition of binge drinking as four drinks for females

and five drinks for males and asks whether participants have had 4/5 drinks in a row in the past month. In the present study, both the male and female measures were given to all participants, and participants' assigned stage was based on their answer to the gender-appropriate question (i.e., "In the past month, have you have 4/5 or more drinks in a row?"). Precontemplation was reflected in the endorsement of the answer "Yes, and I do not intend to stop drinking 4/5 or more drinks in a row." Participants were considered in the contemplation stage if they answered "Yes, but I intend to stop drinking 4/5 or more drinks in a row." Preparation was indicated by endorsement of "Yes, but I intend to stop drinking 4/5 or more drinks in a row during the next 30 days." Participants were considered to be in the action stage if they selected "No, but I have had 4/5 or more drinks in a row in the past 6 months." Maintenance was indicated by "No, and I have not had 5 or more drinks in a row in the past 6 months." Non-binge drinkers endorsed "No, I have never had 5 or more drinks in a row." For analytic purposes, individuals in contemplation, preparation, action, and maintenance were grouped together in order to compare them to the precontemplators and nonbinge drinkers.

*Drinking consequences.* The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) contains twenty-three items designed to assess alcohol problems among adolescents. For the present study, items were rated on a scale that ranges from 0 (never in my life)/1 (not in the past three months) to 4 (five or more times in the past three months), and a total score is calculated. Because the "never in my life" option was added to the original RAPI scale, total scores on this measure are not comparable to White and Labouvie's (1989) original scoring. Sample items include "Kept drinking when you promised yourself not to" and "Not able to do your homework or study for a test." The

measure has shown good reliability (.85 in a study with college students; Carey & Correia, 1997), and White and Labouvie (1989) reported stability coefficients over a three year time period for males and females of .55 and .45, respectively. In the present study, Cronbach's  $\alpha$  was .87 for the pretest and .92 for the posttest measure.

*Typical and heavy drinking.* Participants were asked to reflect on the last 30 days and report on their drinking (number of drinks and time spent drinking per day) during a typical week and during their heaviest drinking week. They recorded the number of drinks per day (between 0 and 16+) and the number of hours spent drinking for each day of the week. Because the common definition of binge drinking is based on the number of drinks (i.e., Wechsler et al., 2005), the average number of drinks for a typical week and a heavy drinking week are used in the analyses.

During the weekly intervention (for a total of eight weeks), participants in all groups completed the following measure.

*Weekly drinking.* Weekly drinking was assessed each week during the eight-week intervention period using a retrospective diary of the number of drinks consumed each day for the past week (Monday through Sunday). The total number of drinks for each week was used as the dependent variable in the hierarchical linear model.

To summarize, all participants completed a pretest and a posttest, which contained measures of readiness-to-change, typical (average and heavy) drinking, and drinking consequences. During the eight-week intervention period, all participants reported on their actual drinking for the past week. In addition, expressive writing participants completed a writing activity in which they wrote about their stress and drinking. Behavioral monitoring participants reported on their past week's drinking, including how

they had obtained alcohol, what type of alcohol they drank, and whether they felt like they had drunk too much. Participants in the expressive writing plus behavioral monitoring condition completed the expressive writing activity and filled out surveys that dealt with their drinking habits for the past week.

### *Research Design and Analyses*

The present study used an experimental pretest/posttest design and utilized a convenience sample of first-year students. Participants completed a pretest at the beginning of their first semester of college, were randomly assigned to one of three intervention conditions, participated in an eight-week intervention (on a weekly basis), and completed a posttest near the end of their first semester.

To evaluate the success of random assignment and determine if any of the demographic variables needed to be controlled for in the analyses,  $\chi^2$  tests of independence were performed on demographic variables [i.e., gender, race, readiness to change group, and binge drinking status (yes/no)] among the three intervention conditions. A one-way between-groups ANOVA was used to assess whether there were differences among the three conditions on age.

Prior to performing any inferential statistics, all variables were checked for non-normality. The distribution of variables was assessed by examining skewness and kurtosis statistics, as well histograms. If necessary, variables were transformed to make them more normal. In addition, all variables to be used in the analyses were checked for outliers by calculating z-scores. As suggested by Tabachnick and Fidell (2001), variables with z-scores greater than 3.3 were replaced with less deviant scores. After making any necessary adjustments to the data, the appropriate statistical assumptions for ANOVA,



multiple regression, and hierarchical linear modeling (HLM) were assessed. The dummy variables and interaction terms required for multiple regression and HLM were also created, and the specific assumptions of ANOVA, multiple regression, and HLM were addressed.

To examine whether participation in the intervention relates to stage of change (Hypothesis #1), three groups were created, with non-binge drinkers in one group, binge drinkers in precontemplation in one group, and binge drinkers in contemplation, preparation, action, and maintenance in the third group. This grouping is similar to that of the Barnett et al. (2006) study. For the present study, the rationale for this grouping was that nonbinge drinkers may see no need to participate in an intervention that deals with drinking. While individuals in precontemplation may also see no need to participate in an intervention, it is possible that their desire to participate or their readiness to change will increase over the course of the study. Participants in contemplation, preparation, action, and maintenance are either considering or maintaining changes, so it is expected that this group would show the most interest and have the highest rate of participation in the intervention. An ANOVA was used to assess whether these three groups differed in the number of weeks they participated in the intervention (i.e., dosage as the dependent variable).

To determine whether after controlling for negative consequences, readiness to change at pretest and gender were related to typical drinking (for an average week and a heavy week) at pretest and at posttest (Hypothesis #2), four hierarchical multiple regressions (HMRs) were planned. Scores on the RAPI were partialled out in the first step, and gender and readiness to change, along with interactions among the dummy-

coded variables, were entered in the second step. Average drinks and heavy drinks (at the pretest and at the posttest) were the dependent variables. It was expected that individuals in later stages of change (i.e., those in contemplation, preparation, action, and maintenance) and males would report more average drinking and heavy drinking at the pretest. Interactions were also examined, and if necessary, simple effects analyses were used to examine the pattern of differences.

To examine whether average drinks, heavy drinks, and negative consequences differ from pretest to posttest among drinkers based on intervention group (randomly assigned), gender, and readiness to change (Hypothesis #3), nine mixed randomized-repeated measures ANOVAs were conducted. It was expected that males, participants in the EWM condition, and binge drinkers in contemplation, preparation, action, and maintenance would decrease their drinking the most and experience the greatest reductions in negative consequences from pretest to posttest. Bonferroni post hoc tests were used to determine where significant differences lay, and simple effects analyses were used to assess any significant interactions.

In order to assess the hypothesis that student drinking would go down over the eight-week intervention period (Hypothesis #4), a hierarchical linear model (HLM) was conducted. Longitudinal HLMs are based on the idea that individuals who are measured repeatedly will likely have similarities among their repeated measurements (Hox, 2002). In other terms, repeated measurements are nested within individuals. The eight weekly measures of drinking were the outcome measure in the model. Time (week of the intervention) was a level 1 predictor because it varied by week. Level 2 predictors are more stable characteristics that describe an individual and do not vary by time (Hox,

2002). Level 2 predictors included readiness to change and drinking consequences at pretest, as well as intervention condition and gender. Cross-level interactions were created to examine potential interactions between the level 2 predictors and time.

The method used to obtain the final HLM was an iterative one, following the procedures suggested by Hox (2002). First, null models were run using restricted maximum likelihood and full maximum likelihood estimation techniques. The restricted maximum likelihood model provided statistics necessary to calculate the intraclass correlation, or the amount of variance at level 2. The full maximum likelihood null model provided a  $\chi^2$  value and degrees of freedom to be used in deviance tests between the models. Next, level 1 variables were added one at a time, and only their fixed components were tested for significance. This procedure was then repeated for the fixed components of the level 2 variables. Next, variance components of level 1 predictors were added to the model one at a time, and the same was done with the level 2 predictors. Finally, cross-level interactions were added to the model. Differences between models were examined using deviance tests on full maximum likelihood statistics.

## CHAPTER IV

### RESULTS

#### *Tests of Random Assignment*

To assess whether random assignment effectively distributed participants among the three conditions,  $\chi^2$  tests of independence were performed on several of the categorical demographic and drinking/readiness to change variables [i.e., gender, race, binge drinker at pretest (yes/no), and readiness to change binge drinking at pretest]. Condition assigned (EW, MON, or EWM) was not significantly dependent on gender,  $\chi^2(2) = 1.32, ns$ . Because a majority of the sample was either White or Black and the  $\chi^2$  test requires sample sizes of greater than 5 in each cell, participants who indicated that they were of other races (i.e., Asian, multiracial, or other) were grouped together for the test. Condition assigned was not significantly dependent on race,  $\chi^2(4) = .54, ns$ . Condition assigned was also not significantly dependent on binge drinking status at pretest,  $\chi^2(2) = 2.63, ns$ , or readiness to change at pretest (using the three categories of non-binge drinker, precontemplators, and participants in all other categories),  $\chi^2(4) = 3.78, ns$ . As a final test for demographic differences among the three experimental conditions, an ANOVA with age as the dependent variable was examined. There were no significant mean differences in age among the three groups,  $F(2,93) = .49, ns$ , partial  $\eta^2 = .01$ , power = .13. Individuals in the expressive writing condition ( $M = 18.13, SD = .34$ ); behavioral monitoring condition ( $M = 18.22, SD = .71$ ), and expressive writing and monitoring condition ( $M = 18.30, SD = .87$ ) did not significantly differ in age, and Levene's test indicated that there was homogeneity of variance among the groups. Based

on these results, it was determined that none of these characteristics needed to be controlled for in the remaining analyses.

#### *Data Screening and Assumptions for Inferential Statistics*

Prior to performing any inferential statistics, the distributions of all continuous variables were checked using histograms and skewness/kurtosis calculations to ensure that they met the assumption of normality. Sample sizes in each group were high enough to assume that the sampling distribution itself would be normally distributed. Several of the drinking-related variables were transformed to make them more normal. Specifically, the average drinks, heavy drinks, and actual drinks variables were positively skewed, and they were all square root transformed. RAPI scores on the pretest were positively skewed, but scores on the posttest were not. Analyses on square root transformed RAPI scores and untransformed variables revealed somewhat different results, so both RAPI scores were transformed to enable interpretation between timepoints. In addition, continuous variables to be used in the analyses were checked for outliers (by gender/intervention condition) by calculating z-scores. As suggested by Tabachnick and Fidell (2001), variables with z-scores greater than 3.3 were replaced with less deviant scores. Missing values (<5%) on variables to be used in the ANOVAs and hierarchical multiple regressions (HMRs) were replaced with the gender/intervention condition mean. Finally, the dummy variables and interaction terms necessary for regression and HLM were created.

ANOVA also assumes independence of errors and homogeneity of variance (Tabachnick & Fidell, 2001). Errors were assumed to be independent, and results of Levene's test (used to assess homogeneity of variance) are reported for all ANOVAs.

Additional assumptions for multiple regression include the ratio of cases to independent variables. With four predictors (i.e., the RAPI, gender, and two dummy-coded readiness to change variables), a sample size of 82 is sufficient, indicating that the present sample of 97 provides sufficient power to test the significance of the multiple correlation. However, it is possible that tests of the individual predictors, which Tabachnick and Fidell (2007) suggest should have a sample size of 108, may be slightly underpowered. Multicollinearity and singularity are issues due to high correlations among the predictors or the inclusion of uncentered interactions in the analysis. However, SPSS automatically checks these assumptions because the analysis cannot be run if this assumption is violated. It is assumed that errors are independent. For a final check of normality, linearity, and homoscedasticity of the residuals, after the regressions are run, residuals will be examined. In addition, standardized residuals were examined in order to determine if there were any outliers in the solution.

Assumptions for HLM were also addressed. The assumptions for HLM are similar to those of multiple regression. Two major exceptions are that missing data on the outcome variable is expected and not replaced, and HLM takes into account the probability that errors of an individual's measurements over time are not independent. Another similarity to regression is that residuals can be examined post hoc to ensure that violations of the assumptions did not have a negative impact on the analyses.

#### *Participation and Stages of Change*

To examine whether participation in the intervention relates to stage of change (Hypothesis #1), three groups were created, with non-binge drinkers in the first group, individuals in precontemplation in the second group, and those in contemplation,

Table 2

*Participation during the Eight Intervention Weeks by Pretest Stage of Change and Gender*

Pretest stage of change	<u>Timepoint</u>							
	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8
<b>Precontemplation</b>								
Males	8 (88.9%)	5 (55.6%)	6 (66.7%)	5 (55.6%)	5 (55.6%)	7 (77.8%)	3 (33.3%)	5 (55.6%)
Females	18 (75.0%)	15 (62.5%)	18 (75.0%)	13 (54.2%)	18 (75.0%)	17 (70.8%)	16 (66.7%)	14 (58.3%)
<b>CPAM</b>								
Males	5 (100.0%)	4 (80.0%)	4 (80.0%)	4 (80.0%)	3 (60.0%)	3 (60.0%)	3 (60.0%)	3 (60.0%)
Females	6 (75.0%)	6 (75.0%)	4 (50.0%)	6 (75.0%)	4 (50.0%)	5 (62.5%)	5 (62.5%)	7 (87.5%)
<b>Non-binge drinker</b>								
Males	15 (68.2%)	16 (72.7%)	17 (77.3%)	12 (54.5%)	19 (86.4%)	19 (86.4%)	17 (77.3%)	20 (90.9%)
Females	26 (51.0%)	28 (54.9%)	74 (62.2%)	28 (54.9%)	36 (73.9%)	39 (76.5%)	33 (64.7%)	34 (66.7%)

preparation, action, and maintenance comprising the third group. Table 2 contains information on participation during the eight intervention weeks by pretest readiness to change and gender.

Table 3

*Effects of Readiness to Change on Participation in Eight-Week Intervention*

Variable and source	SS	MS	F(2,94)
Readiness to change (pretest)			
Between groups	18.01	9.00	1.63
Within groups	519.50	5.53	
Readiness to change (posttest)			
Between groups	1.34	.67	.12
Within groups	536.17	5.70	

The hypothesis that participation in the eight-week intervention would be related to pretest readiness to change was not supported,  $F(2,94) = 1.63$ , *ns*, partial  $\eta^2 = .03$ , power = .34. Binge drinkers in precontemplation ( $M = 5.23$ ,  $SD = 2.27$ ), binge drinkers in contemplation, preparation, action and maintenance ( $M = 5.42$ ,  $SD = 2.39$ ), and non-binge drinkers ( $M = 6.35$ ,  $SD = 2.37$ ) at pretest did not differ in the number of weeks in which they participated in the intervention. Because it is possible that participants changed in their readiness to change from the pretest to the posttest, it was decided to run a similar ANOVA post hoc using the posttest measure of readiness to change as the



independent variable. Similarly, participation in the intervention was not related to posttest readiness to change,  $F(2,94) = .12$ , *ns*, partial  $\eta^2 = .00$ , power = .07. Binge drinkers in precontemplation ( $M = 5.42$ ,  $SD = 2.26$ ), binge drinkers in contemplation, preparation, action and maintenance ( $M = 5.67$ ,  $SD = 2.47$ ), and non-binge drinkers ( $M = 5.67$ ,  $SD = 2.42$ ) at posttest participated in a similar number of weeks in the intervention. Table 3 contains the results of the two univariate ANOVAs. For both of the ANOVAs, Levene's test indicated that there was homogeneity of variance for the three groups examined in the analyses.

Table 4

*Participation Rates by Timepoint (N = 97)*

Time	Participation rate
Week 1	73.2%
Week 2	68%
Week 3	71.1%
Week 4	62.9%
Week 5	74.2%
Week 6	72.2%
Week 7	64.9%
Week 8	72.2%

Frequencies were also run to determine whether participation rates were similar at each timepoint in order to assess whether participation rates were higher among participants when they were paid for taking additional surveys. These payments were given during weeks 3 and 6 of the intervention. Overall, participation rates appeared similar, ranging between 62.9% (week four) and 74.2% (week five). Students participated an average of 5.59 times ( $SD = 2.37$ ), or during 69.9% of the weeks. Participation at week three was 71.1%, and participation at week six was 72.2%. Participation rates for each timepoint appear in Table 4.

#### *Hierarchical Multiple Regressions*

Next, a series of four hierarchical multiple regressions (HMRs) were planned to examine whether after controlling for negative consequences, readiness to change and gender predicted typical drinks for average and heavy drinking weeks at pretest and posttest. However, for the posttest analyses, RAPI scores (the measure of negative consequences) were not correlated with the dependent variables, so it was decided to conduct standard multiple regressions to predict posttest average and heavy drinks. RAPI scores used in the pretest analyses were square root transformed.

In the first HMR, which partialled out RAPI scores in the first step and included gender, readiness to change, and interaction terms (gender by precontemplation and gender by contemplation/preparation/action/maintenance) in the second step, the dependent variable was average drinks. Descriptive statistics and correlations among the variables included in the HMR appear in Table 5. Although being in the contemplation, preparation, action, and maintenance group was not significantly correlated with average drinks, this variable was left in the model because interactions were also of interest.

Table 5

*Means, Standard Deviations, and Intercorrelations for Pretest Square Root Transformed Average Drinks and RAPI, Gender, and Readiness to Change Variables*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4
Average drinks	.73	.66	.29**	.44***	.40***	.02
Predictor variable						
1. RAPI	2.66	1.57	--	-.09	.22	.19
2. Gender	.22	.41		--	--	--
3. Precontemplation	.27	.45			--	--
4. CPAM	.50	.50				--

*Note.* RAPI = Rutgers Alcohol Problem Index; CPAM = contemplation, preparation, action, and maintenance. Correlations are not provided among the dichotomous variables.

\*\* $p < .01$ . \*\*\* $p < .001$ .

In step one, the  $R$  was significantly different from zero,  $F(1,95) = 8.92, p < .01, R = .29, \text{Adj. } R^2 = .08$ . RAPI scores significantly predicted typical drinks in an average drinking week,  $\beta = .29, sr_i^2 = .09$ . Every one point increase in RAPI scores predicts a .29 increase in average drinks. In step two, the  $R$  was significantly different from zero,  $F(6,90) = 12.92, p < .001, R = .68, \text{Adj. } R^2 = .43$ . The combination of RAPI, gender, readiness to change, and interactions between gender and readiness to change significantly predicted average drinks. RAPI score was a marginally significant ( $p = .07$ ) predictor in step two. The interaction between gender and being in contemplation, preparation, maintenance, and action was significant ( $\beta = .36, sr_i^2 = .04$ ), indicating that males in contemplation, preparation, maintenance, and action reported an average of .36

more drinks than male precontemplators and nonbinge drinkers and all females. The interaction between gender and being in contemplation/preparation/action/maintenance suggests that readiness to change moderates the effect of gender on average drinks. However, simple effects analyses for males and females, controlling for RAPI scores, indicated no significant differences in average drinking based on readiness to change for females,  $F(1,73) = .05$ , *ns*, partial  $\eta^2 = .00$ , power = .06. Females in precontemplation and nonbinge drinkers ( $M = .55$ ,  $SD = .49$ ) reported average drinks similar to those in contemplation, preparation, action, and maintenance ( $M = .60$ ,  $SD = .48$ ). Similarly, there was not a significant simple main effect for males,  $F(1,18) = .57$ , *ns*, partial  $\eta^2 = .03$ , power = .11, with males in precontemplation and nonbinge drinkers ( $M = 1.17$ ,  $SD = .80$ ) reporting similar average drinks to those in contemplation, preparation, action, and maintenance ( $M = 1.45$ ,  $SD = 1.09$ ). The main effect of being in contemplation, preparation, action, and maintenance was marginally significant ( $p = .07$ ), as was the interaction between gender and being in precontemplation ( $p = .06$ ). Gender was not a significant predictor in the model, though correlations run prior to the analysis suggested that it would be,  $r(97) = .44$ ,  $p < .001$ . Being in precontemplation ( $\beta = .40$ ,  $sr_i^2 = .07$ ) was a significant predictor of average drinks. Binge drinkers in precontemplation reported an average of .40 more drinks in an average week than nonbinge drinkers and binge drinkers in contemplation, preparation, maintenance, and action (with nonbinge drinkers and binge drinkers not in contemplation considered as a group because dummy coding was used). All results of the hierarchical multiple regression appear in Table 6. Overall, the results of this hierarchical multiple regression indicate that 43% of the variability in typical drinks for an average drinking week can be predicted from the

Table 6

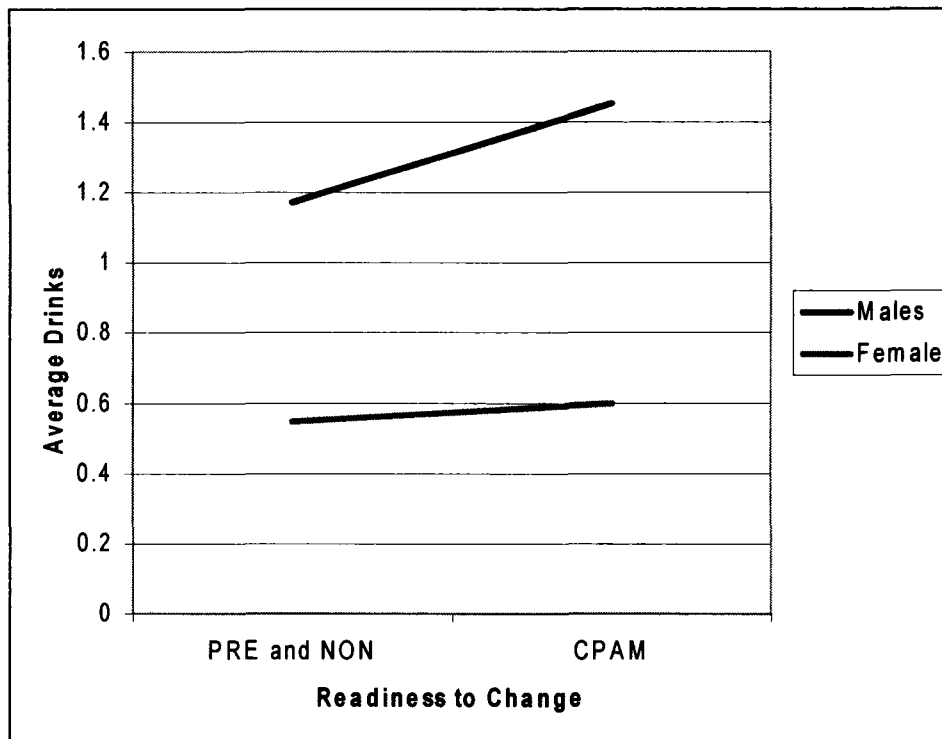
*Hierarchical Regression Analysis Predicting Pretest Square Root Transformed Average Drinks with RAPI, Gender, and Readiness to Change Variables*

Step and predictor variable	$R^2$	$\Delta R^2$	$sr_i^2$	$\beta$
Step 1	.08**	.08**		
RAPI			.09**	.29**
Step 2	.46***	.38***		
RAPI			.02	.16
Gender			.00	.02
Precontemplation			.07**	.40**
CPAM			.02	.21
Gender*Precontemplation			.02	.29
Gender*CPAM			.04	.36*

*Note.* RAPI = Rutgers Alcohol Problem Index; CPAM = Contemplation, preparation, action, and maintenance.

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

combination of RAPI score, gender, and stage of change. Specifically, having higher scores on the RAPI and being in precontemplation predict a greater number of drinks for an average drinking week. Moreover, being a male in the contemplation, preparation, action, and maintenance group also predicts a greater number of average drinks. Figure 1 provides a visual illustration of the interaction between gender and being in contemplation, preparation, action, and maintenance. A scatterplot that illustrated the



*Figure 1.* Interaction between Gender and Contemplation, Preparation, Action, and Maintenance in Predicting Pretest Average Drinks. PRE and NON = precontemplators and nonbinge drinkers; CPAM = contemplation, preparation, action, and maintenance.

relationship between predicted values and residuals revealed that assumptions of the analysis were sufficiently met. An examination of standardized residuals revealed no outliers in the solution.

The second HMR was similar, except that the dependent variable was typical heavy drinks (square root transformed). Descriptive statistics and correlations among the variables included in the HMR appear in Table 7. Although being in the contemplation, preparation, action, and maintenance group was not significantly correlated with heavy drinks, this variable was left in the model because interactions were also of interest.

Table 7

*Means, Standard Deviations, and Intercorrelations for Pretest Square Root Transformed Heavy Drinks and RAPI, Gender, and Readiness to Change Variables*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4
Heavy drinks	1.45	.47	.29**	.40***	.47***	0.05
Predictor variable						
1. RAPI	2.66	1.57	--	-.09	.22	.19
2. Gender	.22	.41		--	--	--
3. Precontemplation	.27	.45			--	--
4. CPAM	.50	.50				--

*Note.* RAPI = Rutgers Alcohol Problem Index; CPAM = contemplation, preparation, action, and maintenance. Correlations are not provided among the dichotomous variables.

\*\* $p < .01$ . \*\*\* $p < .001$ .

In step one, the  $R$  was significantly different from zero,  $F(1,95) = 8.58, p < .01, R = .29, \text{Adj. } R^2 = .08$ . RAPI scores significantly predicted typical drinks in a heavy drinking week,  $\beta = .29, sr_1^2 = .08$ . Every one point increase in RAPI scores predicts a .29 increase in heavy drinks. In step two, the  $R$  was significantly different from zero,  $F(6,90) = 12.26, p < .001, R = .67, \text{Adj. } R^2 = .41$ . The combination of RAPI, gender, readiness to change, and interactions between gender and readiness to change significantly predicted heavy drinks. RAPI score was not significant in the second step, nor was gender. As in the previous analysis, it appears that once RAPI scores were taken into account, gender did not contribute additional prediction. The interaction between gender and being in contemplation, preparation, maintenance, and action was significant ( $\beta = .29, sr_1^2 = .02$ ),

with males in this stage of change reporting an average of .29 more drinks than all other participants. The interaction between gender and being in contemplation/preparation/action/maintenance was further investigated using simple effects analyses, which revealed no significant simple effect of readiness to change for females,  $F(1,73) = .50$ , *ns*, partial  $\eta^2 = .01$ , power = .11 or for males,  $F(1,18) = .66$ , *ns*, partial  $\eta^2 = .04$ , power = .12. Specifically, females in contemplation, preparation, action, and maintenance ( $M = 1.35$ ,  $SD = .34$ ) reported heavy drinks similar to that reported by females in precontemplation and nonbinge drinkers ( $M = 1.36$ ,  $SD = .40$ ). For males, there were no significant differences between those in contemplation, preparation, action, and maintenance ( $M = 1.84$ ,  $SD = .70$ ) vs. precontemplators and nonbinge drinkers ( $M = 1.79$ ,  $SD = .61$ ), and Levene's test indicated that there was heterogeneity of variance between the males. Being in precontemplation ( $\beta = .47$ ,  $sr_i^2 = .10$ ) was a significant predictor of average drinks. Binge drinkers in precontemplation reported an average of .47 more drinks in a heavy drinking week than the nonbinge drinkers and binge drinkers in contemplation, preparation, maintenance, and action. Being in contemplation, preparation, maintenance, and action was a marginally significant predictor of average drinks ( $p = .07$ ). The interaction between gender and being in precontemplation was not significant. All results of the hierarchical multiple regression appear in Table 8. Figure 2 illustrates the interaction between gender and being in contemplation, preparation, action, and maintenance. Overall, the results of this hierarchical multiple regression indicate that 41% of the variability in typical heavy drinking can be predicted from the combination of RAPI score, gender, and stage of change. Specifically, having higher scores on the RAPI and being in precontemplation predicts a greater number of drinks for a heavy drinking



Table 8

*Hierarchical Regression Analysis Predicting Pretest Square Root Transformed Heavy Drinks with RAPI, Gender, and Readiness to Change Variables*

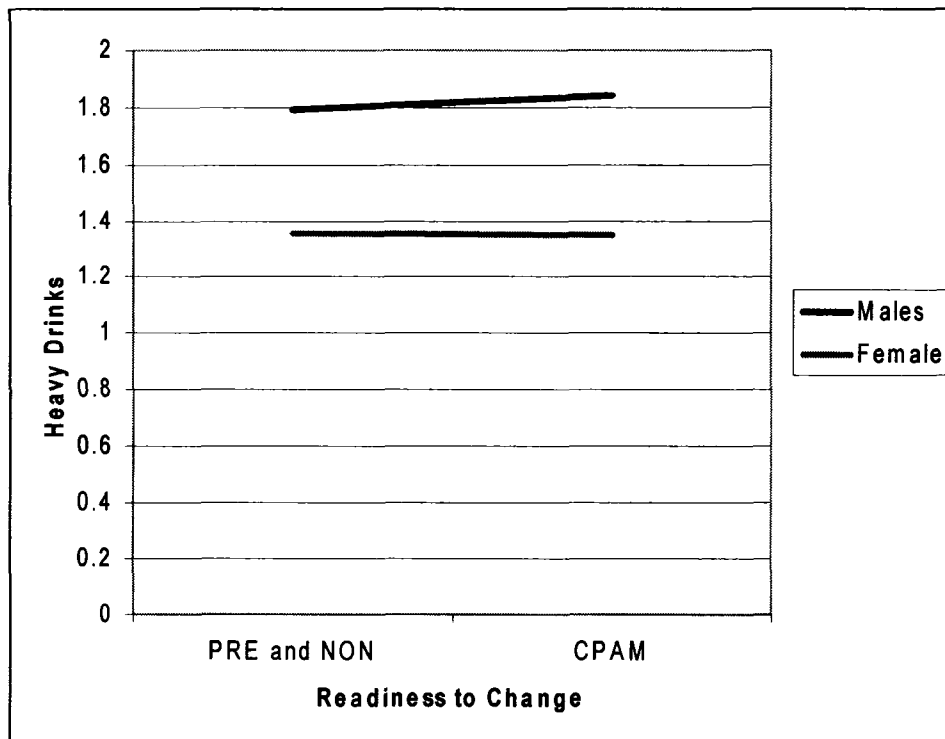
Step and predictor variable	$R^2$	$\Delta R^2$	$sr_i^2$	$\beta$
Step 1	.08**	.08**		
RAPI			.08**	.29**
Step 2	.45***	.37***		
RAPI			.02	.14
Gender			.01	.03
Precontemplation			.10**	.49***
CPAM			.02	.25
Gender*Precontemplation			.02	.25
Gender*CPAM			.02	.29*

*Note.* RAPI = Rutgers Alcohol Problem Index; CPAM = Contemplation, preparation, action, and maintenance.

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

week. Moreover, being a male in contemplation, preparation, action, and maintenance also predicts a greater number of drinks. A scatterplot of the relationship between predicted values and residuals revealed that assumptions of the analysis were sufficiently met. As shown by the standardized residuals, there were no outliers in the solution.

The next two standard multiple regressions were similar to the previous two analyses but were conducted using posttest measures. As previously noted, hierarchical multiple regressions were planned, but because RAPI scores were not significantly



*Figure 2.* Interaction between Gender and Contemplation, Preparation, Action, and Maintenance in Predicting Pretest Heavy Drinks. PRE and NON = precontemplators and nonbinge drinkers; CPAM = contemplation, preparation, action, and maintenance.

correlated with the dependent variables, the first step was omitted. Both regressions included gender, readiness to change (measured at posttest), and interaction terms (gender by precontemplation and gender by contemplation/preparation/action/maintenance).

In the third multiple regression, the dependent variable was average drinks for a typical drinking week (square root transformed) at posttest. Descriptive statistics and correlations among the variables included in the regression appear in Table 9. An initial run of the analysis revealed one outlier in the solution, and because the analysis was

substantially different without the deviant case, the results reported are based on a sample size of 96. In this analysis, the  $R$  was significantly different from zero,  $F(5,95) = 23.35$ ,  $p < .001$ ,  $R = .75$ ,  $\text{Adj. } R^2 = .54$ . The combination of gender, readiness to change, and interactions between gender and readiness to change significantly predicted average drinks at posttest. Gender was not a significant predictor in the model, though correlations run prior to the analysis suggested that it would be,  $r(96) = .39$ ,  $p < .001$ . The interaction between gender and being in precontemplation was significant,  $\beta = .30$ ,  $sr_i^2 = .02$ . Simple effects analyses revealed significant simple main effects for both females, ( $F(1,74) = 50.78$ ,  $p < .001$ , partial  $\eta^2 = .41$ , power = 1.00) and males,  $F(1,18) = 15.78$ ,  $p < .01$ , partial  $\eta^2 = .47$ , power = .96. Females in precontemplation ( $M = 1.07$ ,  $SD = .39$ ) reported greater average drinks than did female nonbinge drinkers and binge drinkers in contemplation, preparation, maintenance, and action ( $M = .35$ ,  $SD = .41$ ). For males, precontemplators ( $M = 1.77$ ,  $SD = .76$ ) also reported more average drinks at posttest than nonbinge drinking males and binge drinkers in contemplation, preparation, action, and maintenance ( $M = .68$ ,  $SD = .50$ ). Levene's test indicated heterogeneity variance between the male groups, with those in precontemplation being more variable. Being in precontemplation ( $\beta = .66$ ,  $sr_i^2 = .20$ ) was a significant predictor of average drinks. Binge drinkers in precontemplation reported an average of .66 more drinks in an average drinking week than nonbinge drinkers and binge drinkers in contemplation, preparation, maintenance, and action. Being in contemplation, preparation, action, and maintenance was a marginally significant predictor of average drinks ( $p = .06$ ). None of the other predictors in the model significantly predicted average drinking. The interaction between gender and being in precontemplation is illustrated in Figure 3, and

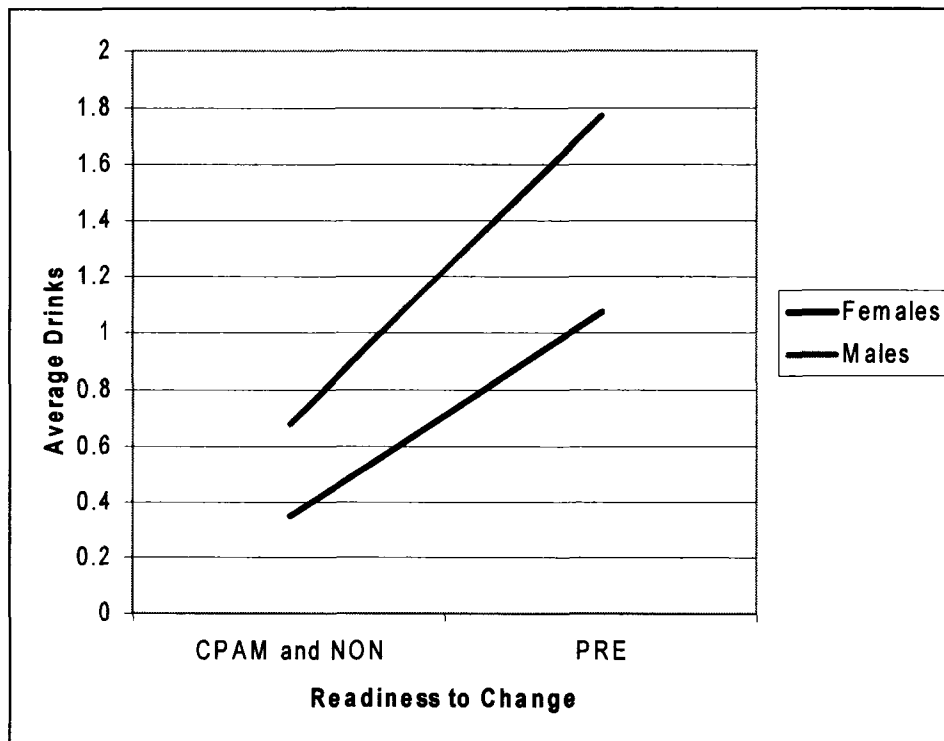
Table 9

*Means, Standard Deviations, and Intercorrelations for Posttest Square Root Transformed Average Drinks and RAPI, Gender, and Readiness to Change Variables*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4
Average drinks	.69	.64	.16	.39***	.64***	-.26**
Predictor variable						
1. RAPI	3.36	1.67	--	.00	.06	.08
2. Gender	.21	.41		--	--	--
3. Precontemplation	.33	.47			--	--
4. CPAM	.45	.50				--

*Note.* RAPI = Rutgers Alcohol Problem Index; CPAM = contemplation, preparation, action, and maintenance. Correlations not provided among the dichotomous variables. \*\* $p < .01$ . \*\*\* $p < .001$ .

all results of the multiple regression appear in Table 10. Overall, the results of the regression indicate that 54% of the variability in typical drinks for an average drinking week can be predicted by stage of change and gender. A scatterplot of the relationship between predicted values and residuals revealed a potential issue with heteroscedasticity of the residuals and illustrated that errors were greater when more drinking was predicted. However, an effort was made to reduce heteroscedasticity prior to the analysis (i.e., transforming the skewed dependent variable), and no additional attempts were made to correct the problem (Tabachnick & Fidell, 2007).



*Figure 3.* Interaction between Gender and Precontemplation in Predicting Posttest Average Drinks. CPAM and NON = contemplation, preparation, action, and maintenance and nonbinge drinkers. PRE = precontemplators.

Refer to Table 11 for descriptives and correlations for the fourth multiple regression. In the fourth multiple regression, an initial run of the analysis revealed one outlier in the solution. This outlier was the same case that was removed in the previous analysis. Because this case impacted the results of the regression, it was removed from further consideration, and the sample size for the following analysis was 96. For the regression, the  $R$  was significantly different from zero,  $F(5,90) = 30.49, p < .001, R = .79$ ,  $\text{Adj. } R^2 = .61$ . The combination of gender, readiness to change, and interactions between gender and readiness to change significantly predicted heavy drinks at posttest. Gender was not a significant predictor in the model, though correlations run prior to the analysis

Table 10

*Standard Regression Analysis Predicting Posttest Square Root Transformed Average Drinks with Gender and Readiness to Change Variables*

Variable	<i>B</i>	SEB	$sr_i^2$	$\beta$
Gender	.05	.24	.00	.03
Precontemplation	.89	.14	.20	.66***
CPAM	.24	.13	.02	.19
Gender*Precontemplation	.65	.30	.01	.30
Gender*CPAM	.46	.30	.01	.19

*Note.* CPAM = Contemplation, preparation, action, and maintenance.

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

suggested that it would be,  $r(96) = .47, p < .001$ . There was a significant interaction between gender and being in precontemplation ( $\beta = .41, sr_i^2 = .04$ ). Simple effects analyses revealed significant simple main effects for both females,  $F(1,74) = 57.44, p < .001$ , partial  $\eta^2 = .44$ , power = 1.00, and for males,  $F(1,18) = 13.87, p < .01$ , partial  $\eta^2 = .44$ , power = .94. Females in precontemplation ( $M = 1.65, SD = .24$ ) reported higher heavy drinking than females in contemplation, preparation, action, and maintenance and nonbinge drinkers ( $M = 1.20, SD = .24$ ), and males in precontemplation ( $M = 2.55, SD = .81$ ) reported higher heavy drinking than male nonbinge drinkers and binge drinkers in contemplation, preparation, action, and maintenance ( $M = 1.49, SD = .41$ ). Levene's test revealed significant heterogeneity of variance between the male groups. There was also a significant interaction between gender and being in contemplation, preparation, action, and maintenance ( $\beta = .25, sr_i^2 = .02$ ). Simple effects analyses indicated that there was a

Table 11

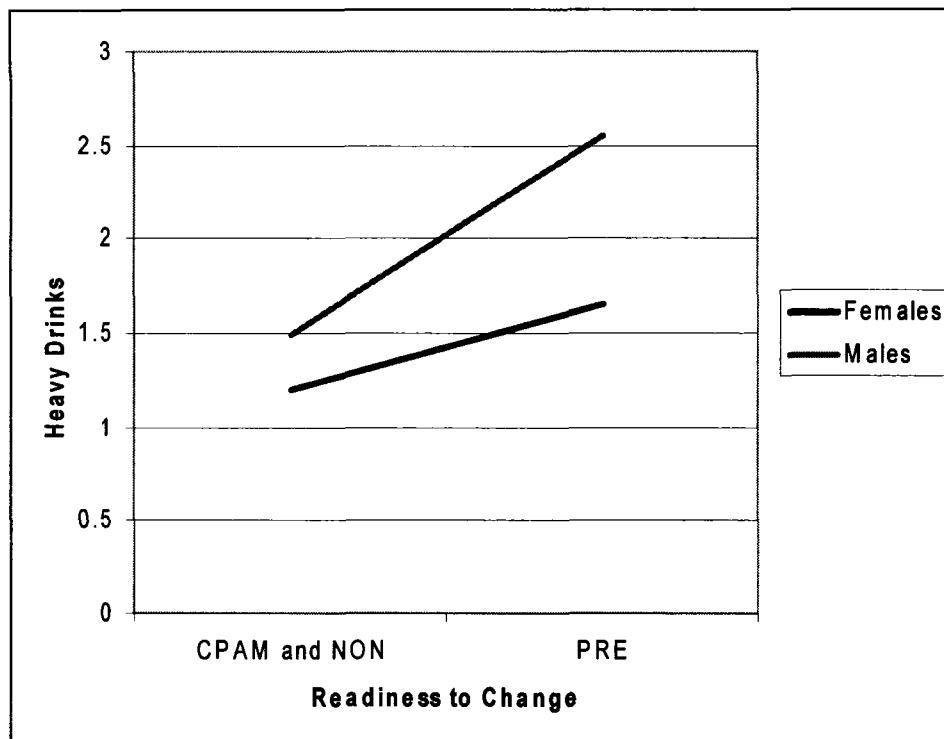
*Means, Standard Deviations, and Intercorrelations for Posttest Square Root Transformed Heavy Drinks and RAPI, Gender, and Readiness to Change Variables*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4
Heavy drinks	1.47	.53	.11	.50***	.59***	-.24**
Predictor variable						
1. RAPI	3.36	1.67	--	.03	.08	.06
2. Gender	.22	.41		--	--	--
3. Precontemplation	.34	.48			--	--
4. CPAM	.44	.50				--

*Note.* RAPI = Rutgers Alcohol Problem Index; CPAM = contemplation, preparation, action, and maintenance. Correlations are not provided among the dichotomous variables.

\*\* $p < .01$ . \*\*\* $p < .001$ .

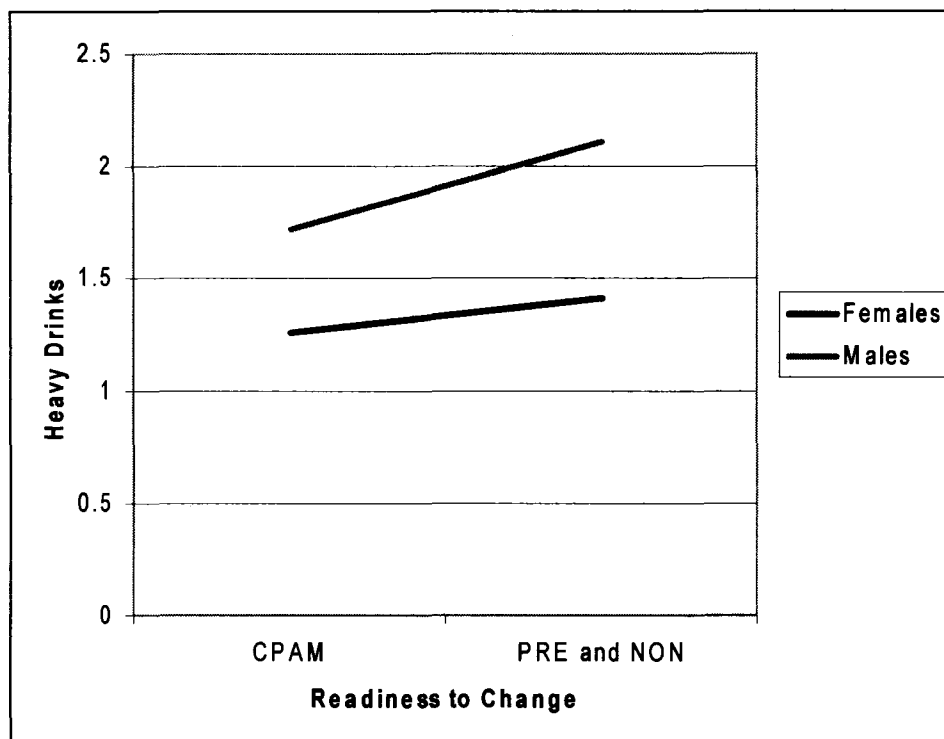
simple main effect for females,  $F(1,74) = 4.57, p < .05$ , partial  $\eta^2 = .06$ , power = .56, but not for males,  $F(1,18) = .58, ns$ , partial  $\eta^2 = .03$ , power = .11. Females in contemplation, preparation, action, and maintenance ( $M = 1.26, SD = .26$ ) reported fewer heavy drinks than did nonbinge drinkers and precontemplators ( $M = 1.41, SD = .35$ ). Males in contemplation, preparation, action, and maintenance ( $M = 1.71, SD = .34$ ) reported fewer heavy drinks than did those in precontemplation and nonbinge drinkers ( $M = 2.11, SD = .96$ ). Levene's test indicated heterogeneity among both males and females, with the combined group of precontemplators and nonbinge drinkers exhibiting the most variability. In addition to the significant interactions, there was a significant main effect for being in precontemplation ( $\beta = .60, sr_i^2 = .16$ ) and being in contemplation,



*Figure 4.* Interaction between Gender and Precontemplation in Predicting Posttest Heavy Drinks. CPAM and NON = contemplation, preparation, action, and maintenance and nonbinge drinkers. PRE = precontemplators.

preparation, action, and maintenance ( $\beta = .25, sr_i^2 = .02$ ). Binge drinkers in precontemplation reported an average of .60 more drinks in a heavy drinking week than nonbinge drinkers and binge drinkers in contemplation, preparation, maintenance, and action. Being in contemplation, preparation, maintenance, and action predicted an average of .25 more drinks in a heavy drinking week than for binge drinkers in precontemplation and nonbinge drinkers. Figures 4 and 5 illustrate the significant interactions between gender and stage of change (precontemplation and contemplation, preparation, action, and maintenance, respectively). All results of the multiple regression appear in Table 12. Overall, the results of this hierarchical multiple regression indicate





*Figure 5.* Interaction between Gender and Contemplation, Preparation, Action, and Maintenance in Predicting Posttest Heavy Drinks. PRE and NON = precontemplators and nonbinge drinkers; CPAM = contemplation, preparation, action, and maintenance.

that 60% of the variability in typical drinks for a heavy drinking week can be predicted from the combination of gender and stage of change. A scatterplot of the relationship between predicted values and residuals revealed a potential issue with heteroscedasticity of the residuals and illustrated that errors were greater when more drinking was predicted. However, an effort was made to reduce heteroscedasticity prior to the analysis (i.e., transforming the skewed dependent variable), and the variables used in interactions were retained in the model even if they were not significant (i.e., gender). The effect of heteroscedasticity is that it weakens the analysis, so no additional attempts were made to correct the problem (Tabachnick & Fidell, 2007).

Table 12

*Standard Multiple Regression Analysis Predicting Posttest Square Root Transformed Heavy Drinks with Gender and Readiness to Change Variables*

Variable	<i>B</i>	SEB	$sr_i^2$	$\beta$
Gender	.03	.18	.00	.02
Precontemplation	.57	.11	.12	.52***
CPAM	.18	.10	.01	.17
Gender*Precontemplation	.87	.23	.06	.48**
Gender*CPAM	.43	.23	.01	.21

*Note.* CPAM = Contemplation, preparation, action, and maintenance.

\* $p < .01$ . \*\*\* $p < .001$ .

*Pretest/Posttest Differences on Drinking and Consequences*

To examine whether average drinks, heavy drinks, and negative consequences of drinking differ over time (from pretest to posttest) based on intervention group (randomly assigned), gender, and readiness to change (Hypothesis #3), it was planned to conduct nine mixed randomized-repeated measures ANOVAs (i.e., one 2x3 time by group, one 2x2 time by gender, and one 2x3 time by readiness to change for each of the three repeated dependent variables of average drinks, heavy drinks, and negative consequences of drinking). As previously described, all of the dependent variables were square root transformed in order to meet the assumption of normality of the sampling distribution. For intervention group and readiness to change, Bonferroni post hoc tests were planned if there were significant mean differences among the groups on the dependent variables while accounting for multiple comparisons. In the event of significant interactions,

Table 13

*Means and Standard Deviations for Males and Females on Square Root Transformed Drinking Variables*

Variable	Men (N = 21)		Women (N = 76)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Average drinking (pre)	1.28	.91	.57	.49
Average drinking (post)	1.11	.83	.56	.52
Heavy drinking (pre)	1.81	.63	1.36	.37
Heavy drinking (post)	1.97	.79	1.34	.32
Negative consequences (pre)	2.38	1.45	2.73	1.61
Negative consequences (post)	3.46	2.03	3.33	1.57

simple effects analyses were planned to examine differences. Means and standard deviations for the dependent variables used in the analyses appear in Table 13 (by intervention group), Table 14 (by gender), and Table 15 (by readiness to change). To test the hypothesis that average drinks differ from pretest to posttest based on intervention group, a 3x2 mixed randomized-repeated measures ANOVA was performed. Levene's test indicated that there was homogeneity of variance among the groups. The interaction between time and intervention condition was not significant,  $F(2,94) = 2.23$ , *ns*, partial  $\eta^2 = .05$ , power = .44, indicating that the pattern of mean differences among the three conditions at the pretest and at the posttest was similar. Results for the main effect of time indicated that the square root transformed average drinks did not differ from pretest ( $M = .73$ ,  $SD = .66$ ) to posttest ( $M = .68$ ,  $SD = .64$ ),  $F(1,94) = .71$ , *ns*, partial

Table 14

*Means and Standard Deviations for Experimental Conditions on Square Root Transformed Drinking Variables*

Variable	EW		MON		EWM	
	(N = 32)		(N = 37)		(N = 28)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Average drinking (pre)	.68	.65	.78	.73	.71	.61
Average drinking (post)	.79	.70	.69	.62	.55	.59
Heavy drinking (pre)	1.45	.44	1.49	.54	1.41	.43
Heavy drinking (post)	1.57	.63	1.47	.53	1.39	.34
Negative consequences (pre)	2.41	1.45	3.00	1.69	2.49	1.51
Negative consequences (post)	3.28	1.27	3.71	1.81	2.98	1.83

$\eta^2 = .01$ , power = .13. The main effect of intervention was not significant,  $F(2,94) = .32$ , *ns*, partial  $\eta^2 = .01$ , power = .10, indicating that square root transformed average drinks for participants in the expressive writing condition ( $M = .73$ ,  $SD = .67$ ), behavioral monitoring condition ( $M = .74$ ,  $SD = .67$ ), and expressive writing and monitoring condition ( $M = .63$ ,  $SD = .60$ ) were similar. Results for the ANOVA appear in Table 16.

Next, the hypothesis that average drinks differed from pretest to posttest based on gender was tested using a 2x2 mixed randomized-repeated measures ANOVA. Levene's test indicated that there was heterogeneity of variance among the groups on the measures of average drinking, with males showing more variability than females. However, ANOVA is fairly robust to violation of this assumption with a two-tailed significance test

Table 15

*Means and Standard Deviations for Readiness to Change on Square Root Transformed Drinking Variables*

Variable	PRE		CPAM		NON	
	(N = 26)		(N = 48)		(N = 23)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Average drinking (pre)	1.16	.54	.74	.69	.21	.28
Average drinking (post)	1.20	.71	.57	.50	.34	.48
Heavy drinking (pre)	1.82	.44	1.43	.45	1.09	.14
Heavy drinking (post)	1.89	.68	1.37	.35	1.21	.34
Negative consequences (pre)	3.22	1.40	2.95	1.25	1.41	1.75
Negative consequences (post)	3.69	1.61	3.57	1.51	2.54	1.85

PRE = Precontemplation; CPAM = Contemplation, preparation, action, and maintenance; NON = nonbinge drinkers.

when there are no outliers, sample size ratios are no greater than 4:1, and the  $F_{\max}$  ratio (which compares the variances of the groups) is no greater than 10:1. Because these additional requirements were met, no transformations to the data or lowered significance level were necessary (Tabachnick & Fidell, 2001). The interaction between time and gender was not significant,  $F(1,95) = 1.40$ , *ns*, partial  $\eta^2 = .02$ , power = .22. The pattern of mean differences for males and females at the pretest and at the posttest was similar. The main effect of time was not significant,  $F(1,95) = 1.77$ , *ns*, partial  $\eta^2 = .02$ , power = .26. Square root transformed average drinks were similar at pretest ( $M = .72$ ,  $SD = .66$ ) and posttest ( $M = .68$ ,  $SD = .64$ ). The main effect of gender was significant,  $F(1,95) =$

Table 16

*Analysis of Variance Results for Experimental Condition and Time Variables on Square Root Transformed Average Drinking*

Source	<i>df</i>	SS	MS	F
Between subjects				
Condition	2	.47	.23	.32
Error 1	94	67.80	.72	
Within subjects				
Time	1	.10	.10	.71
Condition x Time	2	.61	.31	2.23
Error 2	94	12.89	.14	

22.16,  $p < .001$ , partial  $\eta^2 = .19$ , power = .98, indicating that males ( $M = 1.20$ ,  $SD = .87$ ) reported significantly more average drinking (square root transformed) than did females ( $M = .57$ ,  $SD = .51$ ). Table 17 contains the results of the ANOVA.

To test the hypothesis that average drinks differ from pretest to posttest based on readiness to change, a 3x2 mixed randomized-repeated measures ANOVA was performed. Levene's test indicated that there was homogeneity of variance. The interaction between time and readiness to change group was not significant,  $F(2,94) = 2.91$ , *ns*, partial  $\eta^2 = .06$ , power = .56. The main effect of time was not significant,  $F(1,94) = .00$ , *ns*, partial  $\eta^2 = .00$ , power = .05. Average drinks were similar at pretest ( $M = .72$ ,  $SD = .66$ ) and posttest ( $M = .68$ ,  $SD = .64$ ). The main effect of readiness to change was significant,  $F(2,94) = 20.24$ ,  $p < .001$ , partial  $\eta^2 = .30$ , power = 1.0. Bonferroni post

Table 17

*Analysis of Variance Results for Gender and Time Variables on Square Root Transformed Average Drinking*

Source	<i>df</i>	SS	MS	F
Between subjects				
Gender	1	12.91	12.91	22.16***
Error 1	95	55.35	.58	
Within subjects				
Time	1	.25	.25	1.77
Gender x Time	1	.20	.20	1.40
Error 2	95	13.30	.14	

\*\*\* $p < .001$ .

hocs revealed significant differences among all of the groups. Precontemplators reported significantly more average drinks ( $M = 1.18$ ,  $SD = .62$ ) than did individuals in contemplation/preparation/action/maintenance ( $M = .65$ ,  $SD = .59$ ), as well as nonbinge drinkers ( $M = .27$ ,  $SD = .38$ ),  $p < .001$ . Participants in contemplation/preparation/action/maintenance reported more average drinks than did nonbinge drinkers,  $p < .05$ . Refer to Table 18 for the results of the ANOVA.

A similar set of analyses was performed with typical heavy drinking (square root transformed) as the dependent variable. To test the hypothesis that typical heavy drinks differ from pretest to posttest based on intervention group (randomly assigned), a 3x2

Table 18

*Analysis of Variance Results for Readiness to Change and Time Variables on Square Root Transformed Average Drinking*

Source	<i>df</i>	SS	MS	F
Between subjects				
Readiness to change	2	20.55	10.28	20.24***
Error 1	94	47.72	.51	
Within subjects				
Time	1	.00	.00	.00
Readiness to change x Time	2	.79	.39	2.91 <sup>+</sup>
Error 2	94	12.71	.14	

\*\*\* $p < .001$ .

<sup>+</sup> $p = .06$ .

mixed randomized-repeated measures ANOVA was performed. The assumption of homogeneity of variance was assessed and no violations were found with Levene's test. The interaction between time and intervention group was not significant,  $F(2,94) = 1.24$ , *ns*, partial  $\eta^2 = .03$ , power = .26, indicating that the pattern of mean differences by intervention group was similar for the pretest and the posttest. For the independent variable of time, typical heavy drinks did not differ from pretest ( $M = 1.45$ ,  $SD = .47$ ) to posttest ( $M = 1.47$ ,  $SD = .53$ ),  $F(1,94) = .18$ , *ns*, partial  $\eta^2 = .00$ , power = .07. The main effect of intervention condition was not significant,  $F(2,94) = .60$ , *ns*, partial  $\eta^2 = .01$ ,



Table 19

*Analysis of Variance Results for Experimental Condition and Time Variables on Square Root Transformed Heavy Drinking*

Source	<i>df</i>	SS	MS	F
Between subjects				
Condition	2	.49	.25	.60
Error 1	94	38.19	.41	
Within subjects				
Time	1	.02	.02	.18
Condition x Time	2	.24	.12	1.24
Error 2	94	8.94	.10	

power = .15. Typical heavy drinks for participants in the EW condition ( $M = 1.51$ ,  $SD = .54$ ), MON condition ( $M = 1.48$ ,  $SD = .53$ ), and EWM condition ( $M = 1.39$ ,  $SD = .39$ ) were similar. Table 19 contains the results of the ANOVA.

Next, the hypothesis that typical heavy drinks (square root transformed) differ from pretest to posttest based on gender was tested using a 2x2 mixed randomized-repeated measures ANOVA. Levene's test indicated that there was heterogeneity of variance among the groups on the measures of heavy drinking, with males showing more variability than females. However, as previously described, ANOVA is fairly robust to violation of this assumption, and no transformations to the data or lowered significance level were necessary (Tabachnick & Fidell, 2001). The interaction between time and gender was not significant,  $F(1,95) = 2.82$ , *ns*, partial  $\eta^2 = .03$ , power = .38. The pattern

of mean differences by gender was similar at the pretest and the posttest. The main effect of time was not significant,  $F(1,95) = 1.71$ , *ns*, partial  $\eta^2 = .02$ , power = .25, indicating that reported typical heavy drinking at pretest ( $M = 1.45$ ,  $SD = .47$ ) was similar to posttest heavy drinking ( $M = 1.47$ ,  $SD = .53$ ). The main effect of gender was significant,  $F(1,95) = 31.59$ ,  $p < .001$ , partial  $\eta^2 = .25$ , power = 1.00. At both the pretest and the posttest, males ( $M = 1.89$ ,  $SD = .71$ ) reported significantly more heavy drinking than did females ( $M = 1.35$ ,  $SD = .34$ ). Refer to Table 20 for details about the ANOVA.

To test the hypothesis that typical heavy drinks differ from pretest to posttest based on readiness to change, a 3x2 mixed randomized-repeated measures ANOVA was performed. Levene's test indicated that there was heterogeneity of variance in the between-subjects variable, which appeared to be due to lower variability in the group of nonbinge drinkers; no transformations or changes to the significance level were undertaken because ANOVA is robust under the present conditions (Tabachnick & Fidell, 2001). The interaction between time and readiness to change group was not significant,  $F(2,94) = 1.72$ , *ns*, partial  $\eta^2 = .04$ , power = .35, nor was the main effect of time,  $F(1,94) = .97$ , *ns*, partial  $\eta^2 = .01$ , power = .16. The pattern of mean differences for the readiness to change groups was similar at both pretest and posttest, and pretest heavy drinking ( $M = 1.45$ ,  $SD = .47$ ) was similar to posttest heavy drinking ( $M = 1.47$ ,  $SD = .53$ ). The main effect of readiness to change was significant,  $F(2,94) = 23.77$ ,  $p < .001$ , partial  $\eta^2 = .34$ , power = 1.00. Bonferroni post hocs revealed that there were significant differences in typical heavy drinking among all three groups. Precontemplators ( $M =$

Table 20

*Analysis of Variance Results for Gender and Time Variables on Square Root Transformed Heavy Drinking*

Source	<i>df</i>	SS	MS	F
Between subjects				
Gender	1	9.65	9.65	31.59***
Error 1	95	29.03	.31	
Within subjects				
Time	1	.16	.16	1.71
Gender x Time	1	.27	.27	2.82
Error 2	95	8.91	.09	

\*\*\* $p < .001$ .

1.86,  $SD = .56$ ) reported significantly higher heavy drinking than did individuals in contemplation/preparation/action/maintenance ( $M = 1.40$ ,  $SD = .40$ ), as well as nonbinge drinkers ( $M = 1.15$ ,  $SD = .24$ ),  $p < .001$ . Differences between contemplation/preparation/action/maintenance participants and nonbinge drinkers were significant at the  $p < .05$  level. Table 21 contains the results of the ANOVA.

Finally, a similar set of analyses were performed with negative consequences of drinking, assessed using the RAPI scale (square root transformed), as the dependent variable. To test the hypothesis that negative consequences from drinking differ from pretest to posttest based on intervention group (randomly assigned), a 3x2 mixed randomized-repeated measures ANOVA was performed. The interaction between time

Table 21

*Analysis of Variance Results for Readiness to Change and Time Variables on Square Root Transformed Heavy Drinking*

Source	<i>df</i>	SS	MS	F
Between subjects				
Readiness to change	2	12.99	6.50	23.77***
Error 1	94	25.69	.27	
Within subjects				
Time	1	.09	.09	.97
Readiness to change x Time	2	.32	.16	1.72
Error 2	94	8.86	.10	

\*\*\* $p < .001$ .

and intervention group was not significant,  $F(2,94) = .51$ , *ns*, partial  $\eta^2 = .01$ , power = .13. The pattern of differences among the intervention groups was similar at the pretest and the posttest. There were significant time differences on the square root transformed negative consequences variable,  $F(1,91) = 20.68$ ,  $p < .001$ , partial  $\eta^2 = .18$ , power = .99. Negative consequences from drinking were significantly higher at posttest ( $M = 3.36$ ,  $SD = 1.67$ ) than at pretest ( $M = 2.66$ ,  $SD = 1.57$ ). The main effect of intervention was not significant,  $F(2,94) = 1.83$ , *ns*, partial  $\eta^2 = .04$ , power = .37, indicating that negative consequences were similar for participants in the EW condition ( $M = 2.85$ ,  $SD = 1.36$ ), MON condition ( $M = 3.36$ ,  $SD = 1.75$ ), and EWM condition ( $M = 2.73$ ,  $SD = 1.67$ ). Refer to Table 22 for the results of the ANOVA.

Table 22

*Analysis of Variance Results for Experimental Condition and Time Variables on Square Root Transformed Negative Consequences*

Source	<i>df</i>	SS	MS	F
Between subjects				
Condition	2	15.02	7.51	1.83
Error 1	94	385.17	4.10	
Within subjects				
Time	1	22.94	22.94	20.68***
Condition x Time	2	1.13	.56	.51
Error 2	94	104.29	1.11	

\*\*\* $p < .001$ .

Next, the hypothesis that negative consequences differed from pretest to posttest based on gender was tested using a 2x2 mixed randomized-repeated measures ANOVA. Levene's test indicated that there was homogeneity of variance between genders. The interaction between time and gender was not significant,  $F(1,95) = 1.74$ , *ns*, partial  $\eta^2 = .02$ , power = .26, indicating that the pattern of means between genders was similar at the pretest and the posttest. There were significant time differences on negative consequences,  $F(1,95) = 21.20$ ,  $p < .001$ , partial  $\eta^2 = .18$ , power = 1.00. Negative consequences from drinking were significantly higher at posttest ( $M = 3.36$ ,  $SD = 1.67$ ) than at pretest ( $M = 2.66$ ,  $SD = 1.57$ ). The main effect of gender was not significant,  $F(1,92) = .10$ , *ns*, partial  $\eta^2 = .00$ , power = .06. Males ( $M = 2.92$ ,  $SD = 1.74$ ) reported

negative consequences similar to females ( $M = 3.03$ ,  $SD = 1.59$ ). Refer to Table 23 for the results of the ANOVA.

Table 23

*Analysis of Variance Results for Gender and Time Variables on Square Root Transformed Negative Consequences*

Source	<i>df</i>	SS	MS	F
Between subjects				
Gender	1	.42	.42	.10
Error 1	95	399.71	4.21	
Within subjects				
Time	1	23.10	23.10	21.20***
Gender x Time	1	1.90	1.90	1.74
Error 2	95	103.51	1.10	

\*\*\* $p < .001$ .

To test the hypothesis that negative consequences differ from pretest to posttest based on readiness to change, a 3x2 mixed randomized-repeated measures ANOVA was performed. The interaction between time and readiness to change was not significant,  $F(2,94) = 1.36$ , *ns*, partial  $\eta^2 = .03$ , power = .29. Among the readiness to change groups, the pattern of means was similar between the pretest and the posttest. The main effect of time was significant,  $F(1,94) = 22.08$ ,  $p < .001$ , partial  $\eta^2 = .19$ , power = 1.00. Levene's test revealed heterogeneity of variance on the pretest measure among the readiness to

change groups. For reasons previously mentioned, no transformations or changes to the significance level were undertaken. The main effect of readiness to change was significant,  $F(2,94) = 9.23$ ,  $p < .001$ , partial  $\eta^2 = .16$ , power = .97. Bonferroni post hoc indicated that nonbinge drinkers ( $M = 2.60$ ,  $SD = 1.80$ ) experienced significantly fewer negative consequences from drinking than did precontemplators ( $M = 3.45$ ,  $SD = 1.51$ ), as well as individuals in contemplation/preparation/action/maintenance ( $M = 3.26$ ,  $SD = 1.38$ ),  $p < .01$ . Precontemplators and those in other readiness to change categories reported similar numbers of negative consequences. Table 24 contains the results of the ANOVA.

Table 24

*Analysis of Variance Results for Readiness to Change and Time Variables on Square Root Transformed Negative Consequences*

Source	df	SS	MS	F
Between subjects				
Readiness to change	2	65.71	32.85	9.23*
Error 1	94	334.48	3.56	
Within subjects				
Time	1	24.07	24.07	22.08*
Readiness to change x Time	2	2.97	1.49	1.36
Error 2	94	102.44	1.09	

\* $p < .05$ .

To summarize the results of the series of nine ANOVAs, there were no significant interactions between time and the independent variables of interest for average drinks, heavy drinks, or negative consequences. For average drinks, there were significant main effects for gender and readiness to change. Males reported greater average drinks than did females, and there were differences in average drinks among all three readiness to change categories. Precontemplators reported the highest average drinking, followed by binge drinkers in contemplation, preparation action, and maintenance. Nonbinge drinkers reported the least average drinking. Results for heavy drinking were similar, with males reporting higher levels of drinking than females. The pattern of significant differences was also the same among the readiness to change groups. For negative consequences of drinking, there was a significant main effect of time, with all groups examined (for intervention condition, gender, and readiness to change) experiencing greater negative consequences at posttest. There was also a significant main effect of readiness to change. Nonbinge drinkers reported significantly fewer consequences than did the two groups of binge drinkers.

#### *Drinking during the Eight-Week Intervention*

To determine whether drinking trajectories differed over time among the EW, MON, and EWM groups during the eight-week intervention period, a two-level longitudinal hierarchical linear model was assessed. Variables examined in the model included time (coded from 0 to 7, as suggested by Hox, 2002), intervention group (dummy coded using the EWM group as a reference group), gender (with females coded as 0 and males coded as 1), and readiness to change binge drinking (dummy coded with nonbinge drinkers serving as the reference group). In addition, interactions among



intervention group, gender, and readiness to change were examined, along with interactions between each of these variables and time. It was expected that participants in the EWM group, males, and individuals in contemplation/preparation/action/maintenance would experience the largest decreases in drinking over the course of the intervention.

Hierarchical linear models analyze data at different levels to account for nested data. For the hypotheses tested in the present study, observations of drinking (the outcome variable) for eight weeks are nested within individuals. Repeated measurements that vary by time are considered level 1 variables. Time was the level 1 variable. Variables that are measured once and do not vary by time are termed level 2 variables. In the model tested, intervention group, gender, and readiness to change appeared at level 2. In addition, HLM enables the modeling of cross-level interactions. Such interactions tested included time by intervention group, time by gender, and time by readiness to change. A total of 538 observations were used at level 1. Level 2 variables were assessed for a total of 97 participants. Because the outcome variable (drinks per week) was positively skewed, a square root transformation was applied.

Following the procedures set forth by Hox (2002), a null model was initially run with restricted maximum likelihood estimation in order to determine the amount of unpredicted variance in the model. The null model also provided information about the intraclass correlation, which describes the amount of variability at level 2 and is used to determine whether running a two-level model is necessary. The amount of variance at level 2 (the individual), based on restricted maximum likelihood estimation, was 43%, indicating that a sufficient amount of variance existed at level 2 and that HLM was an appropriate technique for analysis. The null model was then run using full maximum

likelihood estimation. This model is referred to as Model 1 in Table 25, which compares  $\chi^2$  statistics between models using deviance tests. Time was then added to the model as a fixed effect (i.e., the slope, or change over time, was not allowed to vary at the individual level). The results of this model appear as Model 2 in Table 25. This procedure was then repeated for the fixed components of the level 2 variables. The results of this model appear as Model 3 in the table. Next, variance components of level 1 predictors were added to the model one at a time, and the same was done with the level 2 predictors. Significant predictors were left in the model, and these results appear as Model 4 in Table 25. Model 4 contains the best model of the data based on findings from Models 2 and 3. Finally, cross-level interactions were added to the model; these appear as Model 5 in Table 25. Differences between models were examined using deviance tests on full maximum likelihood statistics. Tests comparing the deviance statistics of the different models also appear in Table 25, and details about the final model appear in Table 26.

The final model, model 4, revealed several significant predictors of initial drinking (with all other first-level variables controlled for). Being male predicted higher drinking,  $t(93) = 3.58, p < .001$ , and on average, males reported 1.20 more drinks than females in the first week of the intervention. Binge drinkers in precontemplation also drank significantly more,  $t(93) = 4.82, p < .001$ , reporting 1.25 more drinks than nonbinge drinkers and binge drinks in contemplation, preparation, action, and maintenance combined. Being in contemplation/preparation/maintenance/action,  $t(93) = 2.72, p = .01$ , also predicted higher drinking, as compared to nonbinge drinkers and binge drinkers in precontemplation. Binge drinkers in contemplation/preparation/action/maintenance typically reported .42 more drinks than those in the other conditions.

Table 25

*Comparison of Hierarchical Linear Models for Square Root Transformed Weekly Drinking*

Model	df	$\chi^2$ Difference Test
Model 1 (null)	3	
Model 2 (level 1 fixed)	4	M2 - M1 = 1.13
Model 3 (level 2 fixed)	6	M3 - M2 = 41.93***
Model 4 (random coefficients)	11	M4 - M3 = 39.91***
Model 5 (random coefficients with cross-level interactions)	17	M5 - M4 = .79

\*\*\* $p < .001$ .

HLM is also used to model changes in drinking over time, which revealed in significant predictors of the slope of drinking over time. Being in the expressive writing condition predicted a steeper slope of drinking,  $t(529) = 2.16, p < .05$ . Individuals in the expressive writing condition's drinking increased, on average, at a rate of .11 more drinks per week than individuals in the behavioral monitoring and the expressive writing and behavioral monitoring conditions combined. The interaction between gender and being in the monitoring condition was significant,  $t(529) = -3.91, p < .001$ . Males in the monitoring condition reduced their drinking at a rate of .42 drinks per week more as compared to females and individuals in the other intervention conditions. Although neither gender nor being in the monitoring condition were significant predictors of slope, these variables were retained in the model due to the significant interaction.

Table 26

*Results of Final Two-Level Model of Square Root Transformed Weekly Drinking Due to Gender, Readiness to Change, and Intervention Condition*

Fixed effects at level 2 (individual differences)				
Fixed effect	Parameter estimate	Standard error	t-ratio	Approx. df
Intercept	.36	.13	2.71**	93
Gender	1.20	.34	3.58**	93
Precontemplation	1.25	.26	4.82***	93
CPAM	.42	.16	2.72**	93
Fixed effects at level 1 (week)				
Fixed effect	Parameter estimate	Standard error	t-ratio	Approx. df
Intercept	-.01	.04	-.34	529
Gender	.13	.10	1.34	529
Expressive writing	.11	.05	2.16*	529
Behavioral monitoring	.06	.04	1.43	529
Gender*Behavioral monitoring	-.42	.11	-3.91***	529
Random effects				
Random effect	Standard deviation	Variance component	df	$\chi^2$
Individuals	.71	.50	93	282.89***
Time	1.13	1.27		

Note. CPAM = contemplation, preparation, action, and maintenance.

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

The final model (Model 4) was significantly better than the previous model (Model 3),  $\chi^2(11) = 39.91, p < .001$ , and an examination of the residuals files indicated no major issues with assumptions needed for HLM. Gender and readiness to change significantly explained initial drinking, and intervention condition and the interaction between gender and being in the monitoring condition significantly explained students' drinking trajectories during the eight-week intervention period.

As discussed in texts about HLM, the concept of explained variance in HLM is a complex issue, and there are numerous ways to calculate it (Hox, 2002; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). While it would seem logical to simply compare the variance components from the null model to the full model, an issue is that the null model tends to overestimate level 1 variance and underestimate level 2 variance (Hox, 2002). Hox's suggestion is to use the level 1 variance and compare it to the variance in Model 2 to determine the proportion of variance explained at the time level, then use the variance from Model 2 (which includes time as a predictor) as the baseline to determine variance explained at the individual level. Using this method provides an estimate that time explains 1% of the variation in drinking. Note that this is an underestimate of the overall amount of variability in drinking predicted by time, as this method estimates only the fixed effects (i.e., it doesn't include the variability in slopes that was explained). The variables included at level 2 explain 44% of the variation for individuals.

## CHAPTER V

### DISCUSSION

The present study focused on the ability of gender and readiness to change to predict drinking and negative consequences of drinking in the context of three intervention conditions. Hypotheses were designed to examine whether readiness to change was predictive of participation in the intervention; whether gender, negative consequences, and readiness to change predicted average and heavy drinking at pretest and at posttest; whether gender, readiness to change, and intervention group predicted changes in drinking (typical and heavy) and negative consequences of drinking at timepoints at the beginning and end of students' first semester of college; and whether gender, readiness to change, and intervention condition predicted actual drinking during the eight-week intervention period. Prior to running the analyses, several tests were conducted to ensure that the intervention groups were similar at the beginning of the study. The results of these tests indicated that the groups did not differ in their composition in terms of gender, race, proportion of binge drinkers, readiness to change, or age.

#### *Participation and Stages of Change*

The hypothesis that participation in the eight-week intervention would be related to readiness to change binge drinking was not supported. Because inclusion in the present study was limited to participants who had participated in both the pretest and the posttest, it is possible that this method of selecting participants restricted the full range of participation, which could have the impact of attenuating the differences among the

groups. However, the distribution of the participation variable, though somewhat negatively skewed, was within an acceptable range.

It is also noteworthy that it was predicted that binge drinkers in precontemplation and nonbinge drinkers would have the lowest participation rates. The pattern of means at the pretest indicated that precontemplators had the lowest participation rate, as compared to nonbinge drinkers and binge drinkers in contemplation, preparation, action, and maintenance. What was unexpected was that nonbinge drinkers had the highest participation rate (effect size of .03). It is possible that nonbinge drinkers are aware of the stereotype of rampant college drinking and want to present a different view of college students. Based on posttest readiness to change, nonbinge drinkers and binge drinkers and contemplation, preparation, action, and maintenance had the same average participation rates, and rates for precontemplators were again lower. This finding might be an expected reaction of binge drinkers who have indicated that they have no intention to reduce their drinking. Individuals in precontemplation clearly seemed the least inclined to participate in a study related to their drinking.

Another possible reason for the lack of significant differences among the groups is that individuals who decided to participate in the study were sufficiently motivated by payments, incentives, research credits, or the opportunity to participate in a research study. Financial incentives typically increase response rates (Yammarino, Skinner, & Childers, 1991). However, among this sample, a post hoc examination of participation rates among the timepoints did not reveal a rise in participation rates at weeks three and six when participants were offered payment in addition to entry into a raffle, perhaps

indicating that they were motivated for other reasons. The fact that participation rates were fairly high (among those students who chose to participate), with an average participation rate of 70%, supports the possibility that those students were motivated for reasons other than the incentives offered.

#### *Multiple Regressions Predicting Drinking at Pretest and Posttest*

A series of four multiple regressions was used to test the hypothesis that after controlling for negative consequences, readiness to change and gender would be related to average drinking and typical heavy drinking at pretest and posttest. It was predicted that individuals in precontemplation and males would report more drinking and heavy drinking at both the pretest and the posttest. These hypotheses were partially supported. At pretest, significant predictors of average and heavy drinks were negative consequences and being in precontemplation. There was also an interaction between gender and being in contemplation, preparation, action, and maintenance, with males in this stage reporting more average and heavy drinks at pretest. At posttest, the best predictor of average drinks was being in precontemplation, and the interaction between gender and being in precontemplation was significant, though of less importance (based on the  $sr_i^2$  statistics) than the main effect of precontemplation. For heavy drinks, the best predictor was being in precontemplation and the interaction between gender and being in precontemplation and gender and being in contemplation, preparation, action, and maintenance were also significant.

The results of the regression analyses suggest that students' experiences of negative consequences are more related to their drinking when they first arrive at college



than when their first semester ends. It is possible that when students initially come to college, their excitement outweighs their stress. As the semester progresses, their stress levels increase as they become more immersed in new relationships, academic requirements, and increased independence. By the end of the semester, this increased stress may be a greater source of negative consequences than their drinking is. As previous research has found, psychological distress is a better predictor of consequences than drinking (Park & Grant, 2005; Young et al., 2006). Whether or not the results found in the present study support this view could not be determined; however, this analysis does provide support for early interventions for binge drinking. In particular, college personnel could capitalize on the opportunity to intervene at a time when negative consequences are most associated with drinking. Given the relationship between consequences and motivation to change, it is also possible that this would be the ideal time to catch students who are not considering reductions in their binge drinking.

To a large extent, the significant interaction effects found in the regression analyses are misleading. While it generally makes sense to first interpret significant interactions before considering main effects, the effect sizes for the main effects were substantially larger than the effect sizes for the interactions. In addition, because dummy coding was used for the readiness to change categories, with nonbinge drinkers serving as the reference group, it is not surprising that when precontemplators or binge drinkers in contemplation, preparation, maintenance, and action were combined with nonbinge drinkers, the results were significant differences in drinking or greater variability in the results.

Keeping this in mind, the most important takeaways from the series of multiple regressions are that consequences were associated with typical drinking at pretest, but not at posttest. Precontemplators reported more typical drinking (average and heavy) at both pretest and posttest, and being in precontemplation was consistently the best predictor of typical drinking. Although gender was related to drinking, with males reporting more average and heavy drinking than females, it was not a significant predictor in the models tested, potentially due to the significant interactions that were included.

#### *Pretest/Posttest Differences on Drinking and Negative Consequences*

The hypotheses that intervention condition, gender, and readiness to change would predict changes in drinking (average and heavy) and negative consequences from pretest to posttest were not supported. Support for these hypotheses would have been revealed by significant interactions between time and the variables of interest. Because results for average and heavy drinking were almost identical, these analyses are considered together.

Overall, both average and heavy drinking for all participants was similar at pretest and posttest, and there were no significant interactions between time and the variables of interest. At both the pretest and the posttest, the intervention groups all reported similar average and heavy drinking. Based on the results of the HLM, discussed in further detail below, it is surprising that the EW group did not report increased drinking, as that group's drinking tended to increase the most over time. However, drinking for individuals in the EWM condition was lower (.63 for average drinking/1.39 for heavy drinking) than that reported by those in the EW (.73/1.51) and MON (.74/1.48)

conditions. In addition, the effect size for the time by condition interaction was .05 at pretest and .03 at posttest. While this would be considered a small effect and given limited power, a potentially unreliable effect, the results of the HLM, discussed in further detail below, bear out the interpretation that individuals in the EWM condition tended to increase their drinking the least during the eight-week intervention. The fact that this was reflected in the measures of average and heavy drinking suggests the possibility that the changes will be sustained into the future. As would be expected based on previous research, males reported significantly higher average and heavy drinking amounts at both the pretest and posttest than females (e.g., Benton et al., 2006; Sitharthan et al., 1996; Vik, Culbertson, et al., 2000).

In terms of readiness to change, individuals in precontemplation drank significantly more during their reported average and heavy drinking weeks than participants in contemplation/preparation/action/maintenance. This finding is similar to that of Barnett et al. (2006), who found that in contrast to research that examines readiness to change in general, individuals who are considering or trying to reduce their drinking are most interested in changing their binge drinking. In addition, the present study found the same result in a non-referred sample of college drinkers, suggesting that there are a number of binge drinkers who may be interested in changing their drinking behavior. As would be expected, both individuals in precontemplation and those in contemplation/preparation/action/maintenance drank more than nonbinge drinkers.

The hypotheses that intervention condition, gender, and readiness to change would predict changes in negative consequences from drinking from pretest to posttest

were not supported. Overall, time was a significant predictor of negative consequences of drinking; however, this relationship was in the opposite direction than what was predicted. Over the course of the semester, participants reported significantly more negative consequences of drinking at the posttest.

Intervention condition was not a significant predictor of negative consequences. It appears that individuals in all intervention conditions experienced more negative consequences from their drinking as the semester progressed. However, there was a trend towards participants in the expressive writing conditions reporting fewer negative consequences. The small effect size (partial  $\eta^2 = .04$ ) warrants further investigation of the possibility that expressive writing can help reduce negative consequences. Given the literature that suggests that improving psychological welfare would be associated with fewer negative consequences, this finding suggests that expressive writing may be at least a helpful adjunct to drinking interventions (Park & Grant, 2005; Young et al., 2006). Moreover, it would be especially helpful to have a control group to which to compare the monitoring group, as behavioral monitoring has been linked to reduced consequences, even in the absence of reduced drinking (Cronin, 1996).

While it was expected that males would report greater negative consequences from drinking because of the body of research that suggests that they do (e.g., Benton et al., 2006; Sitharthan, Kavanagh, & Sayer, 1996; Vik, Culbertson, et al., 2000), a recent analysis of the RAPI found that only two items on the 23-item measure appeared to function differently for males and females (Neal, Corbin, & Fromme, 2006). Given research suggesting that the impact of specific consequences may be more serious for

females, using a different measure of negative consequences in future research might provide more insight into gender differences. Specifically, it might reveal interactions between gender and negative consequences in predicting some of the drinking variables.

Readiness to change significantly predicted differences in consequences at both pretest and posttest, with nonbinge drinkers reporting fewer negative consequences than binge drinkers in both the precontemplation and contemplation/preparation/action/maintenance groups. However, unlike the Barnett et al. (2006) study, differences in negative consequences between the precontemplators and those individuals in later stages of change were not significant. These differing results do not appear to be due to power issues. The pattern of means was as predicted, with precontemplators reporting more consequences.

#### *Changes in Drinking over Time*

Finally, an HLM was conducted to test the hypotheses that individuals in the expressive writing and monitoring group would decrease their drinking the most, that males would reduce their drinking the most, and that individuals in the contemplation, preparation, maintenance, and action group would decrease their drinking the most. The results of the HLM provided little support for these hypotheses that dealt with changes over time, perhaps in part due to the fact that time was not a very good predictor of changes in drinking. As noted by Del Boca, Darkes, Greenbaum, and Goldman (2004), student drinking during their first year of college did not follow a very linear pattern. A linear relationship would have shown students typically increasing or decreasing their drinking. The lack of linearity would have contributed to difficulties in modeling

changes over time. In the present study, far more variance could be predicted at the individual level than at the different timepoints. In general, participants in the expressive writing and monitoring condition tended to increase their drinking less than those in the expressive writing group and in the behavioral monitoring group (although the parameter estimate for the behavioral monitoring group was not significant, it was positive).

Participants in the expressive writing condition alone seemed to fare the worst. Gender was also not a significant predictor of changes over time, though directionally, males increased their drinking more than did females. The exception appeared to be that males in the monitoring group tended to decrease their drinking significantly over time. This finding is somewhat surprising given previous research suggesting that females would respond better to the monitoring intervention due to the possibility that females would view heavy drinking as less acceptable than would males (Agostinelli et al., 2004). The inclusion of some qualitative questions in the present study may have aided males in reflecting on and recognizing problems due to their drinking.

What was particularly interesting about the HLM results was that stage of change predicted actual drinking at the beginning of the eight-week intervention, with precontemplators reporting the most initial drinking, followed by those in contemplation, preparation, action, and maintenance. Because interactions were also tested, it was of interest to determine whether certain interventions worked better with individuals in different stages of change. This did not appear to be the case, which perhaps suggests that the stage of change individuals are in when they first arrive at college is important in terms of understanding how much they drink, but it has little bearing on how to approach

an intervention with them. To a certain extent, this finding suggests that widespread interventions can be successful with little customization. It may also indicate that understanding readiness to change binge drinking provides useful information that can enable researchers to understand who is most at risk for serious consequences, as well as those who might be most interested in changing their behavior. However, in terms of drinking over time, there was no evidence that individuals increased or decreased their drinking more or less based on their readiness to change.

In terms of success of the interventions of interest, the expressive writing and monitoring intervention seems to hold the most promise for widespread interventions. These students appeared to increase their drinking the least over time, though further investigation using a control group is needed to make evidence-based suggestions. The analyses suggested the possibility that the expressive writing interventions might help reduce negative consequences for students. These preliminary findings suggest intriguing future research on widespread interventions to reduce both drinking and negative consequences for first-year students.

One question that remains is why expressive writing and monitoring might work in helping first-year college students control their drinking. Ames et al. (2005) investigated the effects of expressive writing on smoking cessation and found that although the difference was not statistically significant, participants in an office visit only condition had higher cessation rates than those in an office visit plus expressive writing condition. The researchers proposed the possibility that the expressive writing activity may have focused participants' attention on smoking, thereby increasing their cravings

for cigarettes. Similarly, writing about stress and drinking in the expressive writing conditions may have increased participants' desire to drink. Although the present study did not focus on mechanisms of change, it is possible that self-monitoring of drinking helped participants gain an awareness of a potential problem (Agostinelli et al., 2004) and that this awareness, coupled with an activity designed to reduce stress (i.e., expressive writing), aided participants in maintaining lower drinking levels.



## CHAPTER VI

### CONCLUSIONS

The present study set out to investigate drinking and readiness to change binge drinking among a sample of first-year college students. Of primary interest was whether readiness to change binge drinking was a predictor of participation in the eight-week intervention, as well as whether readiness to change, gender, and intervention condition were related to changes in drinking (average and heavy) and negative consequences of drinking during students' first semester of college. Also of interest was whether gender, intervention condition, and readiness to change differentially predicted actual drinking during the eight-week intervention period.

Gaining a better understanding of readiness to change binge drinking, as well as the experiences of participants in the three intervention conditions, could be of value to college personnel who want to decrease college student drinking. The results of the present study suggest that readiness to change binge drinking among a non-referred sample is similar to what has been found with students who have gotten into trouble from their drinking. Individuals most interested in changing their drinking are likely to be missed by interventions that focus on referred students, and this population may be of special interest, particularly among first-year students.

#### *Strengths and Limitations*

One strength of the present study was that participants were randomly assigned to intervention groups, and all analyses conducted suggested that they were effectively randomly assigned. Another strength was that participation was fairly high over the

eight-week intervention period, with those students included in the present study participating an average of 5.59 times during the eight-week intervention period. In addition, the use of a non-referred sample enabled the present study to extend previous research on readiness to change binge drinking (i.e., Barnett et al., 2006). Among college students, readiness to change has primarily been examined with individuals who have encountered medical, university, or legal authorities due to their drinking. The fact that a number of students in the present research were considering or trying to reduce their binge drinking suggests that non-referred students are also a relevant group for intervention. The fact that the surveys and intervention activities were administered online enabled the researchers to collect a great deal of data, only a small fraction of which was analyzed for the present study. This data will enable a number of follow-up analyses that seem warranted based on the results presented here. For example, normative beliefs about drinking have been linked to how much students drink (Mattern & Neighbors, 2004; Barnett, Far, Mauss, & Miller, 2001; Steffian, 1999). Finally, the inclusion of several measures of drinking administered over time makes it possible to provide evidence for preliminary conclusions not necessarily supported by tests of statistical significance.

On the other hand, the present study also had several limitations. A major limitation of the present study was the lack of control group. While it might not be possible to measure control group participants each week because of measurement reactivity (Kypri et al., 2006; Sitharthan et al., 1996), in order to determine whether the effects of the interventions are superior to no intervention, a control group of some kind

(perhaps a pretest/posttest control group) would be necessary. Another limitation of the study is that in spite of the fact that individuals who chose to participate in the weekly intervention tended to participate at fairly high rates, overall participation in the eight-week intervention was relatively low, which contributed to a lack of power in some of the analyses. Financial incentives were provided at all possible timepoints; however, due to some restrictions of the larger study's funding agency, it was not possible to compensate participants each time they took surveys. It seems likely that providing additional compensation would have encouraged more students to participate. To mitigate this issue, research assistants on the project went to local businesses to request donated raffle prizes. Moreover, although financial incentives typically increase response rate, survey length tends to decrease response rate (Yammarino, Skinner, & Childers, 1991). The pretest was 14 (online) pages long, and the length may have inhibited some from participating in future surveys; the number of participants at any time point in the eight-week intervention was less than half (231) of those who participated in the pretest. Another potential issue that may have contributed to lower participation was the fact that the full survey contained questions that dealt with personal topics, such as sexual risk-taking and illegal drug use, that may have made participants uncomfortable participating in future surveys.

#### *Suggestions for Future Research*

In future research, it would be helpful to measure readiness to change at each timepoint and examine other potential measures of compliance with research protocols. Taken into account, these suggestions would provide greater sensitivity to changes in

readiness to change and provide a better understanding of whether participants were internally motivated by their interest in the research or readiness to change, or whether they participated because of the incentives offered. For the expressive writing groups, it would be possible to examine other potential measures of compliance, such as time spent writing, length of writing, or emotions expressed. Using such measures would help determine whether participants were sufficiently motivated to participate in the intervention, or whether readiness to change also signals intended compliance with research protocols.

The finding that some first-year student binge drinkers are interested in changing their binge drinking also warrants research with this specific population of students. When students come to college seems to be an appropriate time to intervene in order to prevent future negative consequences (Upcraft, 2002). It is of particular interest that in spite of no associated reports of increased average and heavy drinking, negative consequences rose for students. This finding should be explored in future research to determine whether college-related stress contributes to the negative consequences that students experience.

### *Conclusions*

The results of the present study support Barnett et al.'s (2006) finding that readiness to change binge drinking is different from readiness to change drinking in general. Their finding that individuals who are motivated to change their binge drinking actually drink less than those who are not considering changing their drinking has also been extended to a non-referred group of first-year students. It should be of great interest

to researchers and college personnel to know that many students who have not encountered serious negative consequences with authorities might be interested in changing their binge drinking.

There is some evidence to suggest that the expressive writing and monitoring intervention has the potential to intercept students' drinking trajectories and reduce the negative consequences they experience. Based on participation rates, the time required to complete the weekly activity seemed manageable for a majority of students. While this finding requires additional testing, it holds promise in developing widespread interventions for first-year students.

The harm reduction approach to college drinking is popular (e.g., Fromme & Orrick, 2004; Graham, Tatterson, Roberts, & Johnston, 2004; Schulenberg & Maggs, 2002; Turner, Larimer, & Sarason, 2000). Some researchers have pointed to the futility of trying to prevent illegal or excessive drinking (e.g., Park & Grant, 2005; Shulenberg & Maggs; Graham et al., 2004). However, it is apparent from the present study that in spite of the fact that students reported little change in average and heavy drinking from the beginning of the semester until the end, the negative consequences they experienced rose substantially. Intervening early is important, and the present study takes a significant step in identifying interventions that should be examined using a control group in future research.

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## APPENDIX A

### CONTACT INVITATION

Dear First-Year Students:

My name is Dr. Jennifer Ann Morrow and I am a faculty member in the Psychology Department at Old Dominion University. I am conducting a research study (**Project Writing**) looking at first-year students' adjustment to college and their alcohol and other drug use. This study has been funded by the U.S. Department of Education. The Old Dominion University Institutional Review Board has approved this study (#06-062).

Participation in this study is completely voluntary. Participation in this study involves several phases. The first part requires students to fill out a series of online surveys, which should take less than 30 minutes to complete. Online surveys are hosted on a secure website and all responses will remain confidential and all subsequent reports will be based on grouped, not individual data.

If you wish to participate in this study, please go to the link below to complete a brief survey that will request your contact information (name, ODU email address, ODU UIN, mail address, and phone number). This information will be used to contact you to provide information about the research study described above. **Only the first 500 students who respond will be eligible to participate.**

Students who provide their contact information will be contacted by me within one week and asked to either:

A) complete two surveys that ask questions regarding your adjustment to college and substance use. Students assigned to this group will receive a **\$10 Monarch card gift certificate for each survey** they complete (\$20.00 total if they complete both surveys).

or

B) complete four surveys and eight brief (<20 minutes) weekly writing activities. Students assigned to this group will be paid a **\$10 Monarch card gift certificate for each survey** they complete (\$40.00 total if they complete all four surveys). Students in this group will also be eligible to win one of a variety of prizes (**MP3 players, Monarch card gift certificates, jump drives, and restaurant gift certificates**) being raffled off during six weeks of writing activities. Finally, all students assigned to this group who are also enrolled in a Psychology course will receive ½ Psychology Department research credit for each of the 8 brief writing activities they complete (not including the contact information survey below) for a total of 4 Psychology Department research credits if they complete all 8 weekly writing activities.

If you choose to complete the contact survey or future surveys, you should know that you are free to withdraw from the study at any time by just closing the browser window or by emailing me. **You must be 18 years of age or older and a first-year student to participate in this study.**

**The contact information survey will be available for participants to fill out only until September 8, 2006. Please click the link below to go to the survey:**

**<https://periwinkle.ts.odu.edu/surveys/BJXW4Y/>**

To obtain more information about this research project please feel free to contact me.

Sincerely,

Dr. Jennifer Ann Morrow  
Old Dominion University  
Department of Psychology  
Norfolk, VA 23529  
(757) 683-4448 or (757) 683-4591  
projectwriting@odu.edu

**APPENDIX B**  
**CONTACT SURVEY**

**Contact Information for Project Writing**

**Last Name:**

*{Enter text answer}*

[ ]

**ODU UIN (8 digits):**

*{Enter text answer}*

[ ]

**ODU Email Address (please be sure to include @odu.edu at the end):**

*{Enter text answer}*

[ ]

**Mailing Address (address or PO box, city, state, and ZIP code):**

*{Enter answer in paragraph form}*

[

]

**Phone Number (please use the format (XXX)XXX-XXXX):**

*{Enter text answer}*

[ ]

**Please complete the contact information below to indicate your interest in participating in Project Writing. Up to 500 people can participate. The contact information you provide will be used to let you know whether you have been selected for participation and to arrange payment for people who take part in the research project.**

**Thank you!**

**Please click Finish. You will be directed to the ODU homepage.**

**First Name:**

*{Enter text answer}*

[

]

**Alternate Email Address (if you have one):**

*{Enter text answer}*

[

]

## APPENDIX C

### PRETEST INVITATION

Dear First-Year Students:

My name is Dr. Jennifer Ann Morrow and I am a faculty member in the Psychology Department at Old Dominion University. I am conducting a research study (**Project Writing**) looking at first-year students' adjustment to college and their alcohol and other drug use. This study has been funded by the U.S. Department of Education. The Old Dominion University Institutional Review Board has approved this study (#06-062).

Recently, you indicated that you would be interested in participating in this study. Participation in this study is completely voluntary. Participation involves several phases. The first part requires students to fill out an online survey, which should take less than 30 minutes to complete. The online survey is hosted on a secure website and all responses will remain confidential and all subsequent reports will be based on grouped, not individual data.

If you choose to complete the survey, please click the link below. You should know that you are free to withdraw from the study at any time by just closing the browser window or by emailing me. **You must be 18 years of age or older to participate in this study.**

**Survey Website:**

<insert web address>

If you choose to complete the survey, you will be paid \$10, which will be credited to your Monarch card. Also, depending on which activities you have been asked to complete, you will be contacted next week or at the end of the semester to request that you take additional online surveys.

**The survey will be available for participants to fill out only until September 16, 2006.**

To obtain more information about this research project please feel free to contact me.

Sincerely,

Dr. Jennifer Ann Morrow  
Assistant Professor of Psychology  
Old Dominion University  
Department of Psychology  
Norfolk, VA 23529  
(757) 683-4448 or (757) 683-4591  
jmorrow@odu.edu

## APPENDIX D

### PRETEST SURVEY

Dear First-Year Students:

My name is Dr. Jennifer Ann Morrow and I am a faculty member in the Psychology Department at Old Dominion University. I am conducting a research study (Project Writing) looking at first-year students' adjustment to college and their alcohol and other drug use. This study has been funded by the U.S. Department of Education. The Old Dominion University Institutional Review Board has approved this study (#06-062).

Recently, you indicated that you would be interested in participating in this study. Participation in this study is completely voluntary. Participation involves several phases. In this part of the study, you will be asked to read the informed consent form and then complete a survey, which should take less than 30 minutes to complete. The online survey is hosted on a secure website and all responses will remain confidential and all subsequent reports will be based on grouped, not individual data.

Note that you can only click on the survey link once, so please make sure that you have the necessary time and privacy to complete the survey. If you click on the link and realize that you cannot complete the survey at that time, you can email me, and I will send you another link.

If you choose to complete the survey, you will be paid \$10, which will be credited to your Monarch card. Your Monarch Card will be credited within one week of completing this survey; you will receive an email from me stating your account has been credited. Also, depending on which activities you have been asked to complete, you will be contacted next week or at the end of the semester to request that you take additional online surveys.

The survey will be available for participants to fill out only until September 16, 2006.

Sincerely,

Dr. Jennifer Ann Morrow  
Assistant Professor of Psychology  
Old Dominion University  
Department of Psychology  
Norfolk, VA 23529  
(757) 683-4448 or (757) 683-4591  
jmorrow@odu.edu

Please click the "next" button to go to the informed consent form. After you acknowledge that you understand and consent to participation, you will be taken to the survey.

PROJECT TITLE: Project Writing

#### INTRODUCTION

The purpose of this form is to give you information that may affect your decision whether to say YES or NO to participation in Project Writing.

#### RESEARCHERS

The primary researchers for this project are Dr. Jennifer A. Morrow and Dr. Robin J. Lewis, faculty members in the Psychology department in the College of Sciences. Margot E. Ackermann, M.S., is a doctoral student in the Psychology department and is a research associate on this project.

#### DESCRIPTION OF RESEARCH STUDY

Several studies have been conducted looking into the subject of the risky behaviors of first-year college students. The purpose of this research study is to examine the relationships among stress and behaviors such as drug and alcohol use and sexual risk-taking.

If you decide to participate, then you will join a study involving research of these topics. If you say decide to continue, then your participation will last for approximately 30 minutes for this phase of the study. You should plan to fill out the online survey in a private location in which you have access to a computer.

Do you understand the description of the study? If so, please click the "next" button.

*Page 3*

#### EXCLUSIONARY CRITERIA

In order to participate in this study, you should be at least 18 years old.

#### RISKS AND BENEFITS

**RISKS:** If you decide to participate in this study, then you may face a risk of psychological discomfort or stress due to answering questions about stress, risky behaviors, and substance use. Because you are being asked personal questions, unique IDs are being assigned to participants, and survey details will be stored on a password-protected computer in a locked office. After the study has been completed, any link between your name and your unique ID will be destroyed. In addition, we ask you to ensure a confidential atmosphere when completing the surveys.

If you become uncomfortable at any time during your participation, you may discontinue participation in the survey simply by closing the browser window. If after ending participation you still feel uncomfortable, you may contact the University Counseling Center (757-683-4401) or Dr. Robin Lewis (757-683-4210). At any time during the data collection, you have the right to stop the research and decide that you no longer want to participate. If you close the web browser window prior to completing the survey, your responses will not be entered into the database.

**BENEFITS:** The main benefit to you for participating in this study is a greater awareness of any risky behaviors that you engage in. Another potential benefit from this study is better scientific knowledge of the protective factors against risky behaviors in college.

Do you understand the risks and benefits of this study? If so, please click the "next" button.

*Page 4*

#### **COSTS AND PAYMENTS**

The researchers want your decision about participating in this study to be absolutely voluntary. Yet they recognize that your participation will take time. In order to help compensate you for your time and encourage your participation, the researchers will pay you \$10 for completing the survey. If you choose to participate in a similar survey that you will be contacted about later this year, you will be paid \$10 for completing that survey, too.

#### **NEW INFORMATION**

If the researchers find new information during this study that would reasonably change your decision about participating, then they will give it to you.

#### **CONFIDENTIALITY**

All information obtained about you in this study is strictly confidential unless disclosure is required by law. The results of this study may be used in reports, presentations, and publications, but the researcher will not identify you.

#### **WITHDRAWAL PRIVILEGE**

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study -- at any time.

#### **COMPENSATION FOR ILLNESS AND INJURY**

If you say YES, then your consent in this document does not waive any of your legal rights. However, in the event of harm arising from this study, neither Old Dominion University nor the researchers are able to give you any money, insurance coverage, free medical care, or any other compensation for such injury. In the event that you suffer



injury as a result of participation in any research project, you may contact Dr. Jennifer A. Morrow, the principal investigator, at 757-683-4448, or Dr. David Swain, the current chair of the Institutional Review Board, at 757-683-6028 at Old Dominion University, who will be glad to review the matter with you.

#### VOLUNTARY CONSENT

By clicking on the continue button below to go to the online survey, you are saying several things. You are saying that you have read this form and that you understand this form, the research study, and its risks and benefits.

Do you understand the costs and payments/withdrawal information for this study? If so, please click the "next" button.

*Page 5*

If you have any questions later on, then the researchers should be able to answer them:

Dr. Jennifer A. Morrow (757)683-4448 or (757)683-4591 (jmorrows@odu.edu)

Dr. Robin Lewis (757)683-4210 (rlewis@odu.edu)

Margot E. Ackermann (757)683-4591 (macke003@odu.edu)

If at any time you feel pressured to participate, or if you have any questions about your rights or this form, then you should call Dr. David Swain, the current IRB chair, at 757-683-6028, or the Old Dominion University Office of Research, at 757-683-3460.

And importantly, by clicking the button below, you are telling the researcher YES, that you agree to participate in this study. You may print a copy of this form for your records before continuing.

Please click the "next" button to be taken to the survey.

#### Demographics

Please answer the questions below.

How old are you?

*{Choose one} (options = 18 – 60 or older)*

I am a:

*males/female*

My race/ethnicity is:

*{Choose one}*

- African-American/Black
- Asian
- Caucasian/European-American
- Native American
- Multiracial
- Other

If you indicated your race/ethnicity as other, please specify:

*{Enter text answer}*

[ \_\_\_\_\_ ]

Are you Hispanic?

*{Choose one}*

- No
- Yes

I am currently (relationship status):

*{Choose one}*

- Single, not currently in a relationship
- Single, but in a committed relationship
- Married
- Living with a partner

I currently live (housing status):

*{Choose one}*

- In an on-campus residence hall (Rogers, Monarch House, etc.)
- In University Village
- In an off-campus apartment/house, not with parents
- With my parent(s)
- Other

If you indicated that your housing status was other, please specify:

*{Enter text answer}*

[ \_\_\_\_\_ ]

Do you participate in any ODU athletic teams?

*{Choose one}*

- No
- Yes

Are you planning to join a social fraternity/sorority?

*{Choose one}*

- No

- Not sure  
 Yes

### Typical Drinking

In the calendar below, please fill in your drinking rate and time drinking during a TYPICAL WEEK in the last 30 DAYS.

First, think of a typical week in the last 30 days. (Where did you live? What were your regular weekly activities? etc.) Try to remember as accurately as you can how much and for how long you typically drank in a week during that one month period.

For each day of the week in the calendar below, fill in the number of standard drinks typically consumed on that day and the typical number of hours you drank.

Please indicate in the boxes to the right of each day how many drinks you had and the number of hours you spent drinking during a TYPICAL WEEK in the past 30 days.

Drinks:

- I did not drink on this day.  
 1  
 2  
 3  
 4  
 5  
 6  
 7  
 8  
 9  
 10  
 11  
 12  
 13  
 14  
 15  
 16 or more

Hours:

choose one (options = 0/I did not drink on this day – 13+???)

	Drinks	Hours
Monday		
Tuesday		
Wednesday		

Thursday  
 Friday  
 Saturday  
 Sunday

### Heavy Drinking

In the calendar below, please fill in your drinking rate and time drinking during YOUR HEAVIEST DRINKING WEEK in the last 30 DAYS.

First, think of your heaviest drinking week in the last 30 days. (Where did you live? What were your regular weekly activities? etc.) Try to remember as accurately as you can how much and for how long you drank in your heaviest drinking week during the past 30 days.

For each day of the week in the calendar below, fill in the number of standard drinks consumed on that day and the number of hours you drank.

Please indicate in the boxes to the right of each day how many drinks you had and the number of hours you spent drinking during your HEAVIEST DRINKING WEEK in the past 30 days.

Hours:

choose one (options = 0/I did not drink on this day – 13+???)

	Drinks	Hours
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		
Sunday		

### Readiness to Change

In the last month, have you had 4 or more drinks in a row?

{Choose one}

- Yes, and I do not intend to stop drinking 4 or more drinks in a row.
- Yes, but I intend to stop drinking 4 or more drinks in a row during the next 6

months.

- Yes, but I intend to stop drinking 4 or more drinks in a row during the next 30 days.
- No, but I have had 4 or more drinks in a row in the past 6 months.
- No, and I have not had 4 or more drinks in a row in the past 6 months.
- No, I have never had 4 or more drinks in a row.

In the last month, have you had 5 or more drinks in a row?

*{Choose one}*

- Yes, and I do not intend to stop drinking 5 or more drinks in a row.
- Yes, but I intend to stop drinking 5 or more drinks in a row during the next 6 months.
- Yes, but I intend to stop drinking 5 or more drinks in a row during the next 30 days.
- No, but I have had 5 or more drinks in a row in the past 6 months.
- No, and I have not had 5 or more drinks in a row in the past 6 months.
- No, I have never had 5 or more drinks in a row.

#### Rutgers Alcohol Problem Index (RAPI)

Different things happen to people while they are drinking alcohol or because of their drinking. Several of these things are listed below. Please indicate how many times each of the things listed below happened to you within the PAST THREE MONTHS.

- Never in my life
- Not in the past 3 months
- 1-2 times in the past 3 months
- 3-4 times in the past 3 months
- 5 or more times in the past 3 months

1. Not able to do your homework or study for a test.
2. Got into fights with other people (friends, relatives, strangers).
3. Missed out on other things because you spent too much money on alcohol.
4. Went to work or school high or drunk.
5. Caused shame or embarrassment to someone.
6. Neglected your responsibilities.
7. Relatives avoided you.
8. Felt that you needed more alcohol than you used to in order to get the same effect.
9. Tried to control your drinking (tried to drink only at certain times of the day or certain places, that is, tried to change your pattern of drinking).
10. Had withdrawal symptoms, that is, felt sick because you stopped or cut down on drinking.
11. Noticed a change in your personality.

12. Felt that you had a problem with alcohol.
13. Missed a day (or part of a day) of school or work.
14. Wanted to stop drinking but couldn't.
15. Suddenly found yourself in a place that you could not remember getting to.
16. Passed out or fainted suddenly.
17. Had a fight, argument, or bad feeling with a friend.
18. Had a fight, argument, or bad feeling with a family member.
19. Kept drinking when you promised yourself not to.
20. Felt you were going crazy.
21. Had a bad time.
22. Felt physically or psychologically dependent on alcohol.
23. Was told by a friend, neighbor, or relative to stop or cut down drinking.

## APPENDIX E

### EXPRESSIVE WRITING GROUP WEEKLY SURVEY

During your first semester of college, you are being asked to write about your alcohol use and any stressful experiences you have encountered while you are adjusting to college life.

Specifically, we have asked for you to write for at least 20 minutes, once a week for the next eight weeks, about your alcohol use and stressors you have encountered while at college. What we would like you to write about for these writing sessions are your deepest thoughts and feelings about your experiences surrounding your alcohol use and college life.

Everyone adjusts to college differently, and we want to know about how you personally experience your first semester at Old Dominion University. Whatever you choose to write, it is critical that you really focus on your deepest thoughts and feelings. Ideally, we would like you to focus on feelings, thoughts, or changes that you have not discussed in great detail with others.

The only rule we have is that you write continuously for at least 20 minutes each week. Each week after completing your writing activity, you will fill out a brief questionnaire.

Different people will be asked to write about different topics. Because of this, we ask that you not talk with anyone about the study. Your writing is confidential. We will identify your responses by your unique participant number only (this is a number generated by the survey software -- the survey link you receive is unique to each student).

We assure you that none of your writing will be linked to you personally. The one exception is that if what you say indicates that you intend to harm yourself or others, we are legally and ethically bound to match your participant ID with your name. Above all, we want to respect your privacy. If at any time you have questions, you may call the primary researcher, Dr. Jennifer Ann Morrow, at 757-683-4448 or email her ([jmorrow@odu.edu](mailto:jmorrow@odu.edu)).

Please indicate the time you are starting writing.  
{Enter text answer}

Please write about your alcohol use and any stressful experiences you have encountered while you were adjusting to college life this past week.  
{Enter answer in paragraph form}

Please indicate the time you are stopping writing:

*{Enter text answer}*

### Post Writing Questionnaire

Please use the following scale to answer questions about your writing today.

*{Choose one}*

- None/Not at all
- A little
- Some
- Pretty much
- Quite a bit
- A lot/ Extremely

In your writing today...

1. How much emotion did you express?
2. How upset did you feel?
3. How personal was your writing?
4. How difficult was it to write about what you wrote about?
5. How important was what you wrote about?
6. How much did your writing increase your understanding of yourself?
7. To what degree had you previously discussed what you wrote about?

### Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last week. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

*{Choose one}*

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

Please answer the questions below.

1. In the last week, how often have you been upset because of something that happened



- unexpectedly?
2. In the last week, how often have you felt that you were unable to control the important things in your life?
  3. In the last week, how often have you felt nervous and stressed?
  4. In the last week, how often have you dealt successfully with irritating life hassles?
  5. In the last week, how often have you felt that you were effectively coping with important changes that were occurring in your life?
  6. In the last week, how often have you felt confident about your ability to handle your personal problems?
  7. In the last week, how often have you felt that things were going your way?
  8. In the last week, how often have you found that you could not cope with all the things that you had to do?
  9. In the last week, how often have you been able to control irritations in your life?
  10. In the last week, how often have you felt that you were on top of things?
  11. In the last week, how often have you been angered because of things that happened that were outside your control?
  12. In the last week, how often have you found yourself thinking about things that you have to accomplish?
  13. In the last week, how often have you been able to control how you spent your time?
  14. In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?

Please indicate in the boxes to the right of each day how many drinks you had for each day of the past week.

Drinks per day during the last week

*Choose one (options = I did not drink on this day – 16 or more)*

	# of drinks
Monday	(9/11)
Tuesday	(9/12)
Wednesday	(9/13)
Thursday	(9/14)
Friday	(9/15)
Saturday	(9/16)
Sunday	(9/17)

**APPENDIX F****BEHAVIORAL MONITORING WEEKLY SURVEY**

## Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last week. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

*{Choose one}*

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

**Please answer the questions below.**

15. In the last week, how often have you been upset because of something that happened unexpectedly?
16. In the last week, how often have you felt that you were unable to control the important things in your life?
17. In the last week, how often have you felt nervous and stressed?
18. In the last week, how often have you dealt successfully with irritating life hassles?
19. In the last week, how often have you felt that you were effectively coping with important changes that were occurring in your life?
20. In the last week, how often have you felt confident about your ability to handle your personal problems?
21. In the last week, how often have you felt that things were going your way?
22. In the last week, how often have you found that you could not cope with all the things that you had to do?
23. In the last week, how often have you been able to control irritations in your life?
24. In the last week, how often have you felt that you were on top of things?
25. In the last week, how often have you been angered because of things that happened that were outside your control?
26. In the last week, how often have you found yourself thinking about things that you have to accomplish?
27. In the last week, how often have you been able to control how you spent your time?
28. In the last week, how often have you felt difficulties were piling up so high that you

could not overcome them?

### Actual Drinks

Please indicate in the boxes to the right of each day how many drinks you had for each day of the past week.

Drinks per day during the last week

*Choose one (options = I did not drink on this day – 16 or more)*

	# of drinks
Monday	(9/11)
Tuesday	(9/12)
Wednesday	(9/13)
Thursday	(9/14)
Friday	(9/15)
Saturday	(9/16)
Sunday	(9/17)

### Obtaining Alcohol

In the PAST WEEK, have you obtained alcohol in any of the following ways?

*{Choose one}*

- Yes  
 No

1. Bought it myself legally (I'm over 21)
2. Got it from someone who was under 21
3. Used my own fake ID
4. Got it from someone 21 or older
5. Bought it myself without being carded
6. Got it from home (parents, relatives)
7. Got it at an on-campus party in a dorm
8. Got it at a fraternity/sorority party
9. Got it at an off-campus student party

When you drank alcohol last week what exactly did you drink? (check all that apply)

*{Choose all that apply}*

- I did not drink any alcohol last week

- Beer
- Wine
- Shots of liquor
- Mixed drinks

If you drank alcohol last week, please discuss below why you drank alcohol (examples: to relax, to have fun, I was stressed).

*{Enter answer in paragraph form}*

If you drank alcohol last week, do you think you drank more than you should have drunk? Why or why not?

*{Enter answer in paragraph form}*

**APPENDIX G**

**EXPRESSIVE WRITING AND BEHAVIORAL MONITORING WEEKLY**

**SURVEY**

During your first semester of college, you are being asked to write about your alcohol use and any stressful experiences you have encountered while you are adjusting to college life.

Specifically, we have asked for you to write for at least 20 minutes, once a week for the next eight weeks, about your alcohol use and stressors you have encountered while at college. What we would like you to write about for these writing sessions are your deepest thoughts and feelings about your experiences surrounding your alcohol use and college life.

Everyone adjusts to college differently, and we want to know about how you personally experience your first semester at Old Dominion University. Whatever you choose to write, it is critical that you really focus on your deepest thoughts and feelings. Ideally, we would like you to focus on feelings, thoughts, or changes that you have not discussed in great detail with others.

The only rule we have is that you write continuously for at least 20 minutes each week. Each week after completing your writing activity, you will fill out a brief questionnaire.

Different people will be asked to write about different topics. Because of this, we ask that you not talk with anyone about the study. Your writing is confidential. We will identify your responses by your unique participant number only (this is a number generated by the survey software -- the survey link you receive is unique to each student).

We assure you that none of your writing will be linked to you personally. The one exception is that if what you say indicates that you intend to harm yourself or others, we are legally and ethically bound to match your participant ID with your name. Above all, we want to respect your privacy. If at any time you have questions, you may call the primary researcher, Dr. Jennifer Ann Morrow, at 757-683-4448 or email her (jmorrow@odu.edu).

Please indicate the time you are starting writing.  
*{Enter text answer}*

Please write about your alcohol use and any stressful experiences you have encountered while you were adjusting to college life this past week.  
*{Enter answer in paragraph form}*

Please indicate the time you are stopping writing:

*{Enter text answer}*

### Post Writing Questionnaire

Please use the following scale to answer questions about your writing today.

*{Choose one}*

- None/Not at all
- A little
- Some
- Pretty much
- Quite a bit
- A lot/ Extremely

In your writing today...

1. How much emotion did you express?
2. How upset did you feel?
3. How personal was your writing?
4. How difficult was it to write about what you wrote about?
5. How important was what you wrote about?
6. How much did your writing increase your understanding of yourself?
7. To what degree had you previously discussed what you wrote about?

### Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last week. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

*{Choose one}*

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

Please answer the questions below.

1. In the last week, how often have you been upset because of something that happened unexpectedly?
2. In the last week, how often have you felt that you were unable to control the important things in your life?
3. In the last week, how often have you felt nervous and stressed?
4. In the last week, how often have you dealt successfully with irritating life hassles?
5. In the last week, how often have you felt that you were effectively coping with important changes that were occurring in your life?
6. In the last week, how often have you felt confident about your ability to handle your personal problems?
7. In the last week, how often have you felt that things were going your way?
8. In the last week, how often have you found that you could not cope with all the things that you had to do?
9. In the last week, how often have you been able to control irritations in your life?
10. In the last week, how often have you felt that you were on top of things?
11. In the last week, how often have you been angered because of things that happened that were outside your control?
12. In the last week, how often have you found yourself thinking about things that you have to accomplish?
13. In the last week, how often have you been able to control how you spent your time?
14. In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?

#### Actual Drinks

Please indicate in the boxes to the right of each day how many drinks you had for each day of the past week.

Drinks per day during the last week

Choose one (options = I did not drink on this day – 16 or more)

	# of drinks
Monday	(9/11)
Tuesday	(9/12)
Wednesday	(9/13)
Thursday	(9/14)
Friday	(9/15)
Saturday	(9/16)
Sunday	(9/17)

#### Obtaining Alcohol

In the PAST WEEK, have you obtained alcohol in any of the following ways?

*{Choose one}*

Yes

No

1. Bought it myself legally (I'm over 21)
2. Got it from someone who was under 21
3. Used my own fake ID
4. Got it from someone 21 or older
5. Bought it myself without being carded
6. Got it from home (parents, relatives)
7. Got it at an on-campus party in a dorm
8. Got it at a fraternity/sorority party
9. Got it at an off-campus student party

When you drank alcohol last week what exactly did you drink? (check all that apply)

*{Choose all that apply}*

I did not drink any alcohol last week

Beer

Wine

Shots of liquor

Mixed drinks

If you drank alcohol last week, please discuss below why you drank alcohol (examples: to relax, to have fun, I was stressed).

*{Enter answer in paragraph form}*

If you drank alcohol last week, do you think you drank more than you should have drunk? Why or why not?

*{Enter answer in paragraph form}*



## VITA

**Margot E. Ackermann, M.A., M.S.**  
**Old Dominion University**  
**Department of Psychology**  
**Norfolk, VA 23529**

### EDUCATION

2004-present	Old Dominion University, Ph.D., applied experimental psychology
2002-2004	Old Dominion University, M.S., psychology
1989-1991	University of North Carolina at Wilmington, M.A., English
1984-1988	Wake Forest University, B.A., psychology

### RESEARCH EXPERIENCE

05/07-present	Consultant, Department of Education grant
01/07-05/07	Research associate, Old Dominion University
08/06-12/06	Co-supervisor, Program Evaluation and Research Lab
07/06-06/07	Consultant, Teched (Philip Morris USA)
06/05-08/06	Intern, Virginia Department of Health
11/04-08/06	Program evaluator, Portsmouth schools
08/04-07/06	Supervisor, Program Evaluation and Research Lab

### SELECTED PUBLICATIONS AND TECHNICAL REPORTS

- Ackermann, M.E., & Morrow, J.A. (in press). A principal components analysis and validation of the Coping with the College Environment Scale (CWCES). *Journal of College Student Retention*.
- Morrow, J.A., Rudiger, J., Ackermann, M.E., & Said, T. (2006). *PRIDE clubs pretest report: 2005-2006 school year*. For Portsmouth Behavioral Healthcare Services. (Project #561601; 37 tables; 1 appendix; 41 pages).
- Morrow, J.A., Said, T., Ackermann, M.E., & Rudiger, J. (2006). *Bridge Builders clubs pretest report: 2005-2006 school year*. For Portsmouth Behavioral Healthcare Services. (Project #561601; 37 tables; 1 appendix; 39 pages).
- Morrow, J.A., Ackermann, M., & Said, T. (2006). *Bridge Builders program evaluation report: 2005-2006 school year*. For Portsmouth Behavioral Healthcare Services. (Project #561601; 52 tables; 3 figures; 5 appendices; 90 pages).
- Morrow, J.A., Ackermann, M., & Said, T. (2006). *PRIDE program evaluation report: 2005-2006 school year*. For Portsmouth Behavioral Healthcare Services. (Project #561601; 14 tables; 3 figures; 4 appendices; 73 pages).
- Ackermann, M.E., & Morrow, J.A. (2004). *Perceptions of diversity: Psy.D. program quantitative and qualitative results*. For the Virginia Consortium Program in Clinical Psychology (VCPCP) Council of Directors. (No project number; 4 tables; 1 appendix; 24 pages; 12 references).