

A RANDOMIZED CONTROLLED TRIAL  
COMPARING A COMPUTER-BASED PERSONALIZED  
FEEDBACK INTERVENTION WITH AND WITHOUT  
A MODERATION SKILLS MODULE

By

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## CHAPTER I

### INTRODUCTION

Heavy episodic alcohol consumption, or binge drinking, has been a stable and chronic problem on college campuses for many years (Jennison, 2004). Binge drinking or heavy alcohol use, defined as the consumption of 5 or more drinks in one sitting (for men) and 4 or more drinks in one sitting (for women), is a common occurrence on college campuses (Wechsler et al., 2002). With as many as 80 percent of college students endorsing having consumed alcohol in the past year, the probability of large numbers of these students having experienced a binge drinking episode are high. Wechsler and colleagues (2002) found that 44.4% of students surveyed from 119 colleges and universities within the United States endorsed engaging in binge drinking at some point during their college experience. Furthermore almost 23% engaged in this risky pattern of alcohol use three or more times in the previous two weeks.

Heavy alcohol consumption takes a remarkable toll on college students. Consequences related to such drinking patterns range from missing classes to death. While the most common problem associated with drinking is missing class, more serious problems are noted by a substantial number of students. For example, 21.3% engage in



unplanned sexual activities, 12.8% received injuries, 29% endorsed driving after drinking, and 10.4 % damaged property (Wechsler et al., 2002).

The problems associated with binge drinking affect more than just the individual engaging in the behavior. Non-binge drinkers are often affected by the behavior of those who do engage in binge drinking. For example, Wechsler and colleagues found that 60% of students surveyed reported disturbed sleep due to the behaviors of binge drinkers. In addition, 29.2% reported having been insulted or humiliated and 19.5% reported having had experienced unwanted sexual advances from those who had been binge drinking. Not surprisingly, these individuals meet diagnostic criteria for alcohol abuse (APA, 2000).

Given the prevalence of alcohol abuse and the problems associated with heavy episodic use of alcohol, many researchers, policy makers, and college campuses have implemented a variety of prevention strategies to reduce the use of alcohol and/or the problems associated with its use (Larimer & Cronce, 2007). Prevention strategies are generally broken down into two categories: primary prevention strategies and secondary prevention strategies.

Primary prevention strategies typically are designed to reach a large, unspecified, population of students. These strategies include education programs and developing alcohol-free events for students to attend instead of choosing to drink (Marlatt et al., 1998). These strategies are used frequently by colleges and universities, but have not received support from the literature as an efficacious endeavor (Moskowitz, 1989; Walters, Bennett, & Noto, 2000).

Secondary prevention programs focus efforts to reduce binge drinking by targeting populations of students who already drink (Carey, Carey, Maisto, & Henson, 2006; Marlatt et

al., 1998). Many secondary prevention strategies have been shown to be effective (Larimer & Cronce, 2007). These efforts range from moderation skills programs to interventions designed increase motivation to reduce alcohol consumption through personal feedback regarding their alcohol consumption compared to their peers (Walters & Neighbors, 2005). Moderation skills programs, such as the Alcohol Skills Training Program (ASTP) are designed to provide college drinkers with a variety of skills to reduce binge drinking (Fromme, Marlatt, Baer, & Kivlahan, 1994). These skills include alternating between alcoholic and non-alcoholic drinks, choosing quality beverages as opposed to a large quantity of beverages, and identification of expectations from alcohol use. While effective, the intervention is delivered over the course of six sessions, which reduces the number of targeted students that can be reached within a specified time period. More brief secondary prevention strategies have been developed and shown to be as effective as more lengthy moderation skills interventions (Marlatt et al.). It is the use of these brief interventions that is of relevance to the current investigation.

While brief interventions for heavy alcohol use can vary with regard to content of the intervention, they all have in common a component that is designed to increase motivation to change behavior. These brief motivational interventions (BMI's) are based on principles of Miller and Rollnick's (2002) motivational interviewing and often include a discussion of current alcohol use as it relates to normative drinking as a means for increasing the probability of change (Larimer & Cronce, 2007). This normative feedback is based on the assumption that individuals regulate their personal behavior, in part, based on their beliefs that their behavior is in-line with the behavior of others who are similar (Agostinelli, Brown, & Miller, 1995).

Normative feedback that incorporates the individual's specific drinking patterns is often referred to as personalized normative feedback or personalized feedback interventions (PFI's). The most widely cited BMI to date is the Brief Alcohol Screener and Intervention for College Students (BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1998). BASICS is comprised of two main components, a PFI and an ASTP. BASICS has been shown to produce significant reductions in alcohol use and its related problems (Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Borsari & Carey, 2000; Marlatt, et al., 1998; Murphy et al., 2001). While BASICS utilizes both personalized feedback and a ASTP, normative feedback has been shown to be effective in reducing alcohol use without the addition of an ASTP (Lewis & Neighbors, 2007; Agostinelli et al., 1995).

BMI's can be delivered to participants using a variety of methods. Investigators have administered BMI's in-person, by mail, and by computer. Research has found all methods to be effective (Carey et al., 2006; Kypri et al., 2004; Collins, Carey, & Sliwinski, 2002; Marlatt et al., 1998). Recently, computerized or web-based BMI's have begun to dominate the literature. Utilizing computerized BMI's offers the researcher the opportunity to administer these interventions to students quickly and without taxing personnel resources (Walters, Miller, & Chiauuzzi, 2005).

Several studies have found evidence that supports the use of computerized feedback interventions for decreasing heavy drinking and its related consequences (Hester, Squires, & Delaney, 2005; Walters et al., 2005; Walters, Vader, & Harris, 2007). In addition, recent evidence suggests that providing personalized normative feedback via computer is as effective as providing the same information in person (Butler & Correia, 2009; Carey, Henson, Carey, & Maisto, 2009). As with the face to face PFI's, many computer-based

programs are adaptations of the original BASICS face-to-face intervention (Dimeff & McNeely, 2000; Neighbors, Lee, Lewis, Fossos, & Walter, 2009; Walters et al., 2005). These interventions typically include assessment and personalized normative feedback, but may (e.g., Neighbors et al., 2009) or may not include the ASTP component from BASICS (e.g., Walters et al., 2005). Thus, research regarding the utility of including an ASTP, or moderation skills (MS) module, is mixed with some studies including a MS module and others not including a MS module. Both interventions with and interventions without have been shown to be effective in reducing college student drinking.

Conversely, in a recent meta-analysis, Carey, Scott-Sheldon, Carey, & DiMartini (2007) examined 62 individual-level interventions aimed at reducing college student drinking. Results from this analysis found that MS modules interventions were included in 43% of these interventions. Despite being included in almost half of the interventions, including MS components to these interventions predicted less success in reducing consumption than interventions that did not incorporate moderation skills.

Similar to other computerized feedback interventions, the Behavior Change Laboratory at Oklahoma State University developed the Drinking Assessment and Feedback Tool for College Students (DrAFT-CS; Leffingwell, Horton, Mignogna, Jackson, & Lack, 2007; Leffingwell, Leedy, & Lack, 2005). The DrAFT-CS is a 45 minute assessment and personalized feedback intervention designed to follow the assessment and feedback components of the BASICS program. Participants are asked a number of questions related to their current drinking behavior with the guide of a video interviewer, “Joe.” Following the assessment phase, the DrAFT-CS video interviewer interprets computer-generated graphs that compare the participant’s drinking behavior to that of a normative college sample and

provides the participant with feedback regarding their specific pattern of use, including typical and peak blood alcohol level (BAL), criteria met for alcohol use disorders, and money spent on alcohol. Unlike BASICS; however, the DrAFT-CS does not include an ASTP component.

The purpose of the current investigation is to determine if adding a video moderation skills module to the DrAFT-CS program will produce even greater reductions in binge drinking and associated consequences than the DrAFT-CS alone. Participants will be broken down into 4 groups: a DrAFT-CS group, a DrAFT-CS plus moderation skills module group (DrAFT-CS+MSM), a moderation skills only group (MSM), or an assessment only control group (AO). If providing participants with a moderation skills module is beneficial, greater reductions in binge drinking and its associated consequences should be observed compared to DrAFT-CS and AO control groups.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### **The Problem of Binge Drinking by College Students**

Heavy episodic alcohol consumption, or binge drinking, has been a stable and chronic problem on college campuses for more than many years (Jennison, 2004). Binge drinking or heavy episodic alcohol use, defined as the consumption of 5 or more drinks in one sitting (for men) and 4 or more drinks in one sitting (for women), is a common occurrence on college campuses (Wechsler et al., 2002). With as many as 80 percent of college students endorsing having consumed alcohol in the past year, the probability of large numbers of these students having experienced a binge drinking episode are high. Wechsler and colleagues (2002) found that 44.4% of students surveyed from 119 colleges and universities within the United States endorsed engaging in binge drinking at some point during their college experience. Furthermore, almost 23% engaged in this risky pattern of alcohol use three or more times in the previous two weeks.

Heavy alcohol consumption takes a remarkable toll on college students. Consequences related to such drinking patterns range from missing classes to death. While the most common problem associated with drinking is missing class, more serious problems are noted by a substantial number of students. For example, 21.3% engage in unplanned sexual activities, 12.8% received injuries, 29% endorsed driving after drinking

and 10.4 % damaged property (Wechsler et al., 2002).

The problems associated with binge drinking affect more than just the individual engaging in the behavior. Non-binge drinkers are often affected by the behavior of those who do engage in binge drinking. For example, Wechsler and colleagues found that 60% of students surveyed reported disturbed sleep due to the behaviors of binge drinkers. In addition, 29.2% reported having been insulted or humiliated and 19.5% reported having had experienced unwanted sexual advances from those who had been binge drinking. Not surprisingly, as many as 31.6% of college students meet criteria for alcohol abuse (Knight, et al., 2001). In a recent study; however, only approximately 5% of students seek treatment (Presley & Pimentel, 2006).

### **Prevention Strategies for Reducing Alcohol Misuse**

Given the prevalence of alcohol abuse and the problems associated with heavy episodic use of alcohol, many researchers, policy makers, and college campuses have implemented a variety of prevention strategies to reduce the use of alcohol and/or the problems associated with its use (Larimer & Cronce, 2007). Prevention strategies are generally broken down into two categories: primary prevention strategies and secondary prevention strategies.

Primary prevention strategies typically are designed to reach a large, unspecified, population of students. These strategies include education programs and developing alcohol-free events for students to attend instead of choosing to drink (Marlatt et al., 1998). These strategies are used frequently by colleges and universities, but have not received support from the literature as an efficacious endeavor (Moskowitz, 1989; Walters, Bennett, & Noto, 2000).

## **Secondary Prevention Strategies**

Secondary prevention programs focus efforts to reduce binge drinking by targeting populations of students who already drink (e.g., Carey, Carey, Maisto, & Henson, 2006; Marlatt et al., 1998). Many secondary prevention strategies have been shown to be effective (Larimer & Crounse, 2007). These efforts include traditional cognitive-behavioral programs and interventions designed increase motivation to reduce alcohol consumption through personal feedback regarding their alcohol consumption compared to their peers (Walters & Neighbors, 2005).

**Cognitive-behavioral Strategies.** Cognitive-behavioral (CB) approaches to addressing college drinking address both the thoughts associated with drinking behavior and the use alcohol. One common strategy used to address faulty beliefs regarding drinking is to draw attention to college students' expectancies for alcohol use (Darkes & Goldman, 1993). Behavioral interventions for addressing college alcohol typically focus on adding to students' behavioral repertoire for reducing drinking behavior (Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990). Each will be described in turn.

One set of contributing factors to college binge drinking are the beliefs and expectancies held by students who drink alcohol. These beliefs include the belief that alcohol is a social lubricant that can improve social interactions (Jones, Corbin, & Fromme, 2001). Several investigators have tested interventions for challenging these beliefs in the effort to reduce the expectancies that lead to heavy drinking.

One approach to challenging student beliefs about alcohol involves bringing participants into a simulated bar laboratory (e.g., BARLAB at the University of Washington) During this intervention participants are provided non-alcoholic beer and



behavior is observed, recorded and discussed. Following this exercise participants are informed that the beverages consumed did not contain alcohol. This is followed by a discussion about how expectations can influence behavior and whether or not alcohol is necessary for improved social functioning (Fromme et al., 1994).

In one study of expectancy interventions Darkes and Goldman (1993) randomly assigned 74 participants to either an expectancy challenge, a traditional campus prevention consisting of information on the harmful effects of alcohol, or an assessment only control. During the three session expectancy challenge participants were informed that the other participants in the session and themselves were going to be given either alcoholic or non-alcoholic beverages. Participants were asked to interact and identify those participants (including themselves) that were given beverages containing alcohol and those who had received non-alcoholic beverages. Following the challenge, participants were asked to provide their results as to who they believed to have been given beverages containing alcohol. Consistent with theory, there were discrepancies between the participants' predictions (highlighting how they expected those under the influence would behave) and those actually given alcohol. This led to a discussion of the effect of expectancy versus the pharmacological effects of alcohol and general information regarding expectancy theory. Results indicated that participants in the expectancy challenge condition experienced significant reduction in alcohol consumed compared to those in the traditional intervention and those in the assessment only control.

Expectancy challenges can be utilized to address beliefs about alcohol in a variety of domains. Darkes and Goldman (1998) replicated the above study and extended the research to test the effect of expectancy challenges designed to test beliefs about the pro-

social effects of alcohol (replication from Darkes & Goldman, 1993) as well as the affective/cognitive expected effects from alcohol. During this challenge participants were again told that they may or may not be given beverages containing alcohol. Again, participants were asked to predict participants (including themselves) who had received beverages containing alcohol. Unlike the social expectancy challenge (1993), this challenge consisted of a guided imagery exercise designed to elicit feelings of sadness. Participants were then asked to discuss these feelings with the group. Following the discussion participants provided predictions as which group members they felt had received beverages containing alcohol. In a second session, these participants were given the same information, but instead of sadness inducing imagery, participants were asked to solve a series of problems with every group member contributing to each answer. Following this session, participants' expectancies were explored as they relate to affective and cognitive expectations of alcohol use. Results of this intervention supported previous research that suggested that expectancy challenges produce significantly greater reductions in alcohol consumption than control. Type of expectancy challenge (social versus affective/cognitive) did not significantly differ, suggesting that expectancy challenges work regardless of what beliefs about alcohol are specifically challenged.

Another strategy for challenging students' beliefs and expectancies about alcohol is to challenge the perceived normative prevalence of binge drinking on college campuses (i.e., descriptive norms). Normative beliefs regarding how others approve or disapprove of alcohol use (i.e., injunctive norms) are also addressed (Carey, Borsari, Carey, & Miasto, 2006). For the purposes of the present investigation we will focus on descriptive norms. Research suggests that college students who engage in binge drinking tend to

over-estimate the prevalence of binge drinking on college campuses (Borsari & Carey, 2003; Prentice & Miller, 1993). Interventions designed to provide feedback regarding the true normative data regarding binge drinking and to provide a discrepancy between the students' current rate of binge drinking and that of the normative college sample. By providing binge drinking students with a frame of reference it allows the students to evaluate their own drinking by highlighting the discrepancy between their personal drinking behavior and normative standards (Collins, Carey, & Sliwinski, 2002).

In one such investigation, Neighbors, Larimer, and Lewis (2004) randomly assigned 252 college students endorsing at least one heavy drinking episode (5 drinks or more in one sitting for men, 4 drinks or more for women) in the past month to either a personalized normative feedback (PNF) intervention or a assessment-only control group. The PNF intervention consisted of computer generated feedback with a discussion normative college drinking and a comparison of the student's drinking behavior to the actual normative sample. The results indicated that students in the PNF group demonstrated a significantly greater reduction in alcohol consumption compared to their assessment-only peers.

Beyond the cognitive strategies described above, CB strategies also address overt behaviors associated with drinking. Developed from the harm reduction model of substance use disorders (Marlatt, 1997), alcohol skills training postulates that more individuals can be reached from an accepting, non-abstinence based message. Specifically, individuals are capable of moderating their alcohol consumption if they are provided skills necessary to do so (Marlatt, 1997). These interventions typically consist of various modules or sessions that focus on drink refusal skills, alternating between

alcoholic and non-alcoholic beverages, relapse prevention, and calculating estimates of blood alcohol concentration (BAC) when drinking (Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990).

One such intervention is the Alcohol Skills Training Program (ASTP; Fromme et al., 1994). Based on a social learning perspective of college drinking, students are assumed to have learned what to expect from alcohol and how to use alcohol from peers who also abuse alcohol (Marlatt & George, 1984). Alcohol abusing college students would thus benefit from learning about the nature and effects of alcohol use as well as several skills designed to moderate use. Moderation of use maximizes the pleasurable effects of alcohol use without this episodic use escalating to levels where harm associated with alcohol use is more likely.

Fromme and colleagues (1994) outlined the ASTP as a six-session group intervention. The first session consisted of identifying students' expectancies about the effects of alcohol, their personal use, and peak BAC. In addition, students were provided with information regarding the effects of alcohol and were provided feedback comparing their typical use to societal and local norms. The second session focused on alcohol expectancies and students participate in an expectancy challenge. The third session focuses on skill building by providing students with skills for moderating drinking behavior (e.g., alternating between alcoholic and non-alcoholic drinks, focusing on quality over quantity, and selecting drinks with lower alcohol content). The fourth session focuses on a discussion of alcohol as a social lubricant and addresses alternatives toward viewing alcohol as "liquid courage." The fifth session discusses emotional triggers for drinking. Students learn skills for dealing with negative emotional states that do not

include alcohol (e.g., relaxation exercises, meditation). The sixth and final session addresses lapse and relapse by defining slips as an isolated incident that may occur, but does not indicate that gains have been lost (Fromme et al., 1994).

In the first study of the ASTP, Kivlahan and colleagues (1990) randomly assigned 43 moderate to heavy drinking college students to either the ASTP intervention, an alcohol information class control group, or an assessment only control group. Participants in the ASTP group received eight sessions including education on models of addiction, training in calculating an estimated BAC, relaxation training, nutrition information and suggestions for aerobic exercise, antecedents and behaviors associated with heavy drinking, assertiveness and drink refusal training, an expectancy challenge, and relapse prevention strategies. Participants in the ASTP group demonstrated significantly greater reductions in drinks per week and peak BAC.

Fromme and Corbin (2004) evaluated another skills training program for both campus volunteers and disciplinary referrals. One hundred twenty-four disciplinary referrals and 452 campus volunteers were randomly assigned to either a peer-led skills group, a professional-led skills group, an assessment-only control group, or a waitlist control group. Results did not indicate a clear advantage for either peer-led or professional-led groups. Participants in the skills training conditions demonstrated significantly greater reductions in binge drinking and driving after drinking compared to assessment and waitlist-only controls.

**Brief Motivational Interventions.** Brief interventions for heavy alcohol use can vary with regard to content of the intervention; however, they all have a common component that is designed to increase motivation to change behavior. These brief

motivational interventions (BMI's) are based on principles of Miller and Rollnick's (2002) motivational interviewing and often include a discussion of current alcohol use as it relates to normative drinking as a means for increasing the probability of change (Larimer & Crouce, 2007; Walters & Neighbors, 2005). This normative feedback is based on the assumption that individuals regulate their personal behavior, in part, based on their beliefs that their behavior is in-line with the behavior of others who are similar (Agostinelli, Brown, & Miller, 1995). Personalized normative feedback (PNF) interventions seek to highlight discrepancies between the participant's drinking habits, perceived drinking norms, and alcohol related problems as they relate to societal norms (Collins, et al., 2002). In addition to PNF, some of these interventions also include feedback that is not normative. These personalized feedback interventions (PFI's) provide information regarding individual use including risk for dependence, BAC as it relates to levels of consciousness, and possible health-related consequences in addition to PNF. PNF interventions and PFI's are one component of the MI style of therapeutic interaction that lends itself to brief interventions. Feedback alone may not be effective (Walter, Vader, Harris, Field, & Jouriles, 2009); however, the data are mixed (Neighbors et al., 2004; Lewis et al., 2007). Incorporating other MI principles to the feedback including emphasizing personal choice, non-judgmental responding, and exploring ambivalence may enhance the effectiveness of BMI's (Walters et al., 2009).

#### **Brief Alcohol Screening and Intervention for College Students (BASICS).**

Building upon the literature supporting the use of motivational approaches to treating alcohol use, as well as, the literature supporting CBT strategies, BASICS was one of the first programs to incorporate both cognitive-behavioral and motivational components

(Dimeff et al., 1999). BASICS was designed as a two session intervention. Session one consists of an assessment of drinking behavior, drinking expectancies, and alcohol-related problems. Session two consists of personalized feedback based on the assessment, and skills for moderating alcohol use (Dimeff et al., 1999). CB techniques are utilized during the second session as participants' beliefs (expectancies) about alcohol use are challenged and participants are taught skills for moderating drinking behavior. Research examining the efficacy of this brief intervention has supported its use as an efficacious treatment for reducing alcohol use and its related problems in at-risk college students (Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Larimer et al., 2001; Marlatt et al., 1998; Murphy et al., 2001).

In the first randomized controlled trial of the BASICS program, Marlatt and colleagues (1998) randomly assigned 348 first-year college students endorsing heavy episodic drinking (defined as drinking at least monthly and consuming 5-6 drinks in one drinking occasion in the past month or reported 3 or more alcohol related problems on 3 to 5 occasions in the past 3 years) were randomly assigned to complete BASICS or were assigned to an assessment only control condition. Results indicated that participants in the BASICS condition at six month follow-up reported drinking less frequently, consuming fewer drinks, and consuming fewer drinks during a peak drinking occasion than participants in the control condition. Baer, Kivlahan, Blume, McKnight, and Marlatt (2001) examined the above participants at three- and four- years follow-up. The investigators found that quantity of drinks per occasion and negative consequences associated with drinking significantly declined over time and was significantly lower for those in the intervention group. Additional analyses indicated that primary effect of the

BASICS program had its impact during the baseline to one year follow-up assessments, and that these effects hold for three- and four-year follow-up assessments (Baer et al., 2001).

In another replication of the BASICS intervention described above, Murphy and colleagues (2001) examined the effects of a BASICS intervention compared to an alcohol education and discussion session and an assessment-only control condition in 84 randomly assigned participants (83% of the sample was freshman and sophomores). Results indicated that there was a significant difference in drinks per week and occasion meeting criteria for a binge episode (4 drinks in one sitting for Females, 5 or more for Males) such that participants in the BASICS condition consumed fewer drinks per week and fewer drinks per sitting than participants in the other conditions. As was found in the original BASICS investigations (Baer et al., 2001; Marlatt et al., 1998), frequency of drinking occasions was not significant between groups. This likely reflects the nature of harm reduction approaches where reducing number of drinking occasions is not emphasized while safer drinking practices are encouraged (Dimeff et al., 1999).

Larimer and colleagues (2001) extended the existing literature on BASICS to a sample of fraternities. Six fraternities were randomly assigned to receive BASICS and six were assigned to an assessment plus a one hour presentation regarding alcohol use. In addition to the individual BASICS intervention, fraternity houses assigned to BASICS also received house-specific feedback targeting house drinking norms and their deviation from the participants' beliefs about their fraternity brothers' use. BASICS interventions were delivered by either trained graduate students or trained undergraduate research assistants. Differences between interventionists were also examined. As with the other



studies, intervention participants averaged significantly fewer drinks per week than control, but displayed no significant differences in drinks per occasion or frequency of consumption. Fraternity houses in the BASICS condition also demonstrated significantly greater reductions in typical BAC compared to control houses. Finally, there were no significant differences between interventions delivered by graduate and undergraduate trained assistants.

Borsari and Carey (2000) also utilized a BASICS framework in order to replicate the original efficacy studies of the intervention focusing more heavily on the MI skills inherent in the feedback related to alcohol use, norms, and expectancies. Sixty participants were randomly assigned to either the modified BASICS intervention or an assessment only control condition. Similar to previous research, the investigators examined number of occasions per week, frequency of drinking occasions per month, frequency of binge drinking episodes in the past month (4 or more for women, 5 or more for men in one sitting), and problems associated with binge drinking. Results suggest that the modified, MI-focused, BASICS intervention was effective in reducing number of occasions per month, occasions per week, and binge drinking frequency. No differences were found for alcohol-related problems.

More recently researchers have attempted to increase the brevity of the BASICS intervention. Current research has begun to examine the use of PFI's as a stand-alone intervention for reducing binge drinking in college students (Collins et al., 2002; Kypri et al., 2004; Neighbors et al., 2004; Walters, Miller, & Chiauuzzi, 2005). These interventions have been delivered in a variety of formats, including face-to face, mailed, and computerized PNF. It should be noted; however, that these interventions are often based

on BASICS and typically differ only in amount of face-to-face contact and/or use of a moderation skills module.

One such example of a face-to-face PFI compared a BMI similar to BASICS to a BMI enhanced with a decisional balance exercise designed to discuss the positive and negative aspects of both behavior change and maintaining the status quo (Carey et al., 2006). In addition, the authors examined the efficacy of a Timeline Followback (TLFB; Sobell & Sobell, 1996) assessment procedure as a stand-alone intervention and in conjunction with BMI interventions. Five hundred and nine participants were randomly assigned to one of six conditions (TLFB plus control, TLFB plus BMI, TLFB plus enhanced BMI, control only, BMI only, or enhanced BMI only). Results indicated that TLFB plus control exhibited significantly greater reductions in drinks per week, fewer drinks per occasion, fewer binge drinking episodes per month and lower peak BAC than control only participants. Participants in all BMI conditions (regardless of TLFB status) demonstrated significantly greater reductions in the aforementioned outcome variables. The enhanced BMI condition produced significantly greater reductions in alcohol use variables than control conditions, but did not significantly differ from basic BMI interventions. This outcome suggests that adding a decisional balance exercise does not add to the effectiveness of basic BMI interventions.

**Mailed PFI.** As previously mentioned, research has begun to examine a variety of different PFI dissemination strategies. One such strategy for altering the delivery of BMI's is the use of mailed PNF. Mailed feedback allows the participant to receive feedback from an assessment session without having to return to the laboratory or meet with a clinician or research assistant. Agostinelli and colleagues (1995) randomly

assigned 26 participants to either a mailed PFI or a no-feedback control group. The results indicated that participants receiving the mailed PFI experienced reductions in alcohol consumption and average weekly BAC compared to the no-feedback control participants who experienced no such change in consumption or average weekly BAC.

Collins and colleagues (2002) randomly assigned 100 participants meeting study criteria (consuming 4 or more drinks [for women] and 5 or more drinks [for men] on two or more occasions in one month) to either a mailed PNF intervention or a standard psychoeducational brochure. Results indicated that participants in the mailed PNF group demonstrated significantly greater reduction in alcohol consumption. Specifically, mailed PNF participants reported a significant reduction in binge drinking episodes over the past month, compared to a slight increase in binge drinking episodes observed in the control group. Participants in the PNF condition also demonstrated a greater understanding of the discrepancy between their perceptions of college norms and actual reported norms compared to control participants.

The above findings are promising and address an issue critical to the implementation of BMI's. Larimer and colleagues (2007) note that one challenge associated with face-to-face BMI's is that they require specialized training and on-going supervision of interventionists. The ability to utilize mailed feedback eliminates the need for such training and supervision. Larimer and colleagues sought to replicate and extend mailed PFI's such as that described above. The authors randomly assigned 1,488 participants to either a mailed PFI condition or an assessment only control condition. Participants were mailed feedback consistent with that produced by the BASICS intervention as well as additional mailings of moderation skills, college drinking norms,

and instructions on how to calculate BAC. Of the original 1,488 participants 1,000 were retained for 12 month follow-up. Drinking variables (peak BAC, past month frequency, total drinks per week, and frequency of drinking over past year) were condensed into a single dependent variable. Results indicated that participants in the mailed PNF condition reported significantly less drinking at follow-up than those in the control condition.

**Computer-based PNF.** Another novel approach to delivering PNF interventions that has proven to be an effective intervention for binge drinking among college students is the adaptation of the BMI to computer-based formats. The Multi-Media Assessment of Student Health (MMASH; Dimeff & McNeely, 2000) was among the pioneers of the computer-based PNF interventions. Dimeff and McNeely utilized the components of BASICS (screening, knowledge of alcohol and its effects, knowledge of risk, PNF of students drinking and beliefs of drinking norms, and moderation skills). MMASH differed from BASICS in that computer software was used for all screening, allowing the student to receive immediate computer-generated graphic feedback and moderations strategies and personalized tips. Although MMASH included computer-based screening and immediate print-outs, it still relied on face-to-face discussion of the results with a health professional. Dimeff (1997; as cited in Dimeff & McNeely, 2000) tested the efficacy of MMASH in 78 participants randomly assigned to either MMASH or a treatment-as-usual control condition. Results indicated that participants in the experimental condition reported fewer binge episodes in the past week and fewer alcohol-related problems.

The MMASH intervention provided evidence supporting the use of computer-based PNF interventions. One critique of this intervention is that it still required a large

amount of participant interaction with providers. Building upon this approach, Kypri and colleagues (2004) tested the efficacy of computer-based screener and brief intervention (e-SBI). The e-SBI also included components similar to BASICS. Feedback included risk status, estimated BAC, norm-based comparisons, and comparisons of their drinking with recommendations for upper limits. All feedback information was provided to the participants as a summary of the above mentioned dimensions. One hundred and four participants were randomly assigned to either the e-SBI condition or a psychoeducation control. Results revealed a significant effect for treatment such that the e-SBI group reported significantly lower alcohol consumption, fewer heavy drinking episodes, and fewer alcohol-related problems.

The intervention developed by Kypri and colleagues (2004) demonstrated that computer-based PNF can be implemented as a stand-alone intervention without the use of a face-to-face component. Other programs have attempted to build into the feedback component a MI style of providing feedback (Hester, Squires, & Delaney, 2005). Incorporating a MI style to feedback via computer can be difficult due to the need to utilize empathy, emphasize personal choice, and be non-judgmental. Clearly designing a computer program that mimics such a sophisticated style of responding is challenging, but not impossible.

Hester and colleagues (2005) designed a stand-alone PFI that attempted to minimize resistance to the feedback using empathic, accepting reflections. The Drinker's Check-up (DCU) is a six-module computerized PNF. Participants complete assessment materials via computer and are immediately provided the generated feedback similar to that already discussed. Participants are asked to comment on their PFI via menu options.

Depending on the option chosen, the program generates a response that reflects the feelings endorsed by the participants. Following the feedback module participants are directed to a module designed to assess readiness to change. Participants ready or unsure to address change were then directed to a decisional balance exercise, a moderations skills module, and a plan for change module. In order to test the efficacy of the DCU 61 participants were randomly assigned to either an immediate intervention group or a delayed intervention group (began DCU protocol 4 weeks after the immediate group began). Results indicated that the immediate group demonstrated significantly greater reduction in drinking behavior during the first four weeks of the study compared to the delayed group.

Walters, Vader, and Harris (2007) evaluated yet another computer-based PFI, the electronic-Check-Up to Go (e-CHUG). Consistent with other PFI's, e-CHUG is an on-line program containing both assessment and PFI components. Following the on-line assessment, participants are provided a PFI summarizing their drinking behavior (peak BAC, drinks consumed). In addition they were given comparisons to college norms, estimated risk for alcoholism, annual money spent on alcohol, and explanation and advice. Walters and colleagues randomly assigned 106 participants to either e-CHUG feedback or assessment only control. Participants in the e-CHUG condition demonstrated a significant decrease in drinks per week and peak BAC at eight-week follow-up. At 16-week post-intervention measures remained significantly below control. In addition, a significant decrease in alcohol related problems has observed. Finally, participants in the e-CHUG condition became more accurate than control participants in estimating how their drinking compared to others.

As with the BASICS intervention, computerized PFI's have been utilized to target specific populations. Neighbors, Lee, Lewis, Fossos, and Walter (2009) examined such a program in order to reduce alcohol consumption on participants' 21<sup>st</sup> birthdays. Adapted from BASICS, participants who completed the on-line assessment were presented with feedback regarding their intended number of drinks on their 21<sup>st</sup> birthdays; the resulting intended BAC, and information of the effects of various BAC levels. Participants were also given norms for drinking behavior for individuals on their 21<sup>st</sup> birthday. Finally, participants were presented with a list of strategies to moderate their drinking on their birthdays. Results indicated that relative to control, participants in the computerized PFI displayed significantly lower peak BAC on their birthday.

Similar to other computerized feedback interventions, the Behavior Change Laboratory at Oklahoma State University developed the Drinking Assessment and Feedback Tool for College Students (DrAFT-CS; Leffingwell, Horton, Mignogna, Jackson, & Lack, 2007; Leffingwell, Leedy, & Lack, 2005). The DrAFT-CS is a 45-minute assessment and personalized feedback intervention designed to follow the assessment and feedback components of the BASICS program. Participants are asked a number of questions related to their current drinking behavior with the guide of a video interviewer, "Joe." Following the assessment phase, the DrAFT-CS video interviewer interprets computer-generated graphs that compare the participant's drinking behavior to that of a normative college sample and personal risk associated with current use. Unlike BASICS; however, the DrAFT-CS does not include an ASTP component. Like other computerized PFI's, assessment and feedback are completed via computer without any face-to-face interaction with an interviewer. Unique to DrAFT-CS is that feedback is

provided by a virtual interviewer that reviews the results of the assessment explaining the results and normative drinking patterns of college students.

In one unpublished trial of the DrAFT-CS intervention, Leffingwell and colleagues (2007) randomly assigned 85 heavy-drinking participants to either the DrAFT-CS intervention or an assessment only control. Participants receiving the DrAFT-CS intervention significantly reduced the quantity of weekly drinks at one month follow-up compared to control participants. These results remained consistent at both four- and sixth-month follow-up.

Although both face-to-face and computer-based PFI's have garnered a great deal of support as effective interventions for addressing binge drinking in college students, recent research has sought to determine if there is an advantage of one mode of delivery over the other. Butler and Correia (2009) compared a face-to-face BASICS intervention to a computerized assessment and feedback intervention. Eighty-four participants were randomly assigned to BASICS, a computerized PFI, or an assessment only control condition. Although no significant differences were observed for alcohol-related problems, results indicated that both face-to-face and computerized PFI demonstrated significantly greater reductions in frequency of alcohol use, frequency of binge drinking occasions, and number of drinks consumed per sitting. The implications of this research highlight the effectiveness of computerized PFI's as a stand-alone intervention for addressing binge drinking in college students.

The aforementioned studies all have in common the use of PFI to affect change in binge drinking behavior. Although the studies differ in delivery of the intervention, all of the interventions attempt to increase motivation for change through developing



discrepancies between the participants' behaviors and beliefs about alcohol use and by highlighting risk associated with such use. One area for which there exists variation among the interventions is use of a moderation skills module (or ASTP). Several studies have utilized a moderation skills component similar to that from the original BASICS intervention (Borsari & Carey, 2000; Butler & Correia, 2009; Dimeff & McNeely, 2000; Hester et al., 2005). Others did not utilize a moderation skills component (Kypri et al., 2004; Leffingwell et al., 2007; Leffingwell et al., 2005; Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007; Walters et al., 2007). Both have been shown to be effective in reducing alcohol use in high risk samples. To date, no one study has examined the unique contribution of moderation skills components. In a recent meta-analysis, Carey, Scott-Sheldon, Carey, & DiMartini (2007) examined 62 individual-level interventions aimed at reducing college student drinking. Results from this analysis found that MS interventions were included in 43% of these interventions. Despite being included in almost half of the interventions, including MS components to these interventions predicted less success in reducing consumption than interventions that did not incorporate moderation skills. Again, this provides evidence from a meta-analytic review, and does not provide evidence from a RCT designed to examine the unique contribution of MS modules.

### **Present Study**

The purpose of the current investigation was to examine the unique contribution of a moderation skills module to a computer-based PFI. As with the other interventions from the Behavior Change Laboratory, the current investigation utilized the DrAFT-CS program. The DrAFT-CS lends itself well to such an investigation because it currently does not incorporate a moderation skills module. Participants were randomly assigned to

one of four groups: a DrAFT-CS group, a DrAFT-CS plus moderation skills module group (DrAFT-CS + MS), a moderation skills module only group (MS only), or an assessment only (AO) control group. If providing participants with a moderation skills module is beneficial, greater reductions in binge drinking and its associated consequences should be observed compared to DrAFT-CS alone and assessment only control.

In addition, the present study hoped to replicate and extend previous research examining the efficacy of computerized PFI's. The use of such interventions provides college campuses with brief, cost-effective programs for addressing binge drinking for at-risk populations (Walters et al., 2005). Research examining the efficacy of such interventions has supported their use (Butler & Correia, 2009; Dimeff & McNeely, 2000; Walters et al., 2005). Interventions often include both skills training and personalized feedback (e.g., Neighbors et al., 2009), but some have examined the efficacy of PFI's alone (Walters et al., 2005). Results from these investigations have garnered supporting evidence that these interventions are efficacious with and without a skills training component. Currently no studies have systematically tested the effect of the moderation skills component within a single investigation. The purpose of the present study was to replicate and extend previous research examining the efficacy of a computerized PFI and to investigate the unique contribution of moderations skills interventions by comparing the DrAFT-CS computerized PFI to the DrAFT-CS + MS, a MS only, and an assessment only control condition.

**Hypothesis 1.** Participants receiving either DrAFT-CS or DrAFT-CS + MS will experience significantly greater reductions in alcohol consumption and alcohol-related

consequences compared to participants receiving the MS alone intervention or the AO control condition.

**Hypothesis 2.** Participants receiving the DrAFT-CS and DrAFT-CS + MS interventions will experience significantly greater reductions in alcohol consumption, as well as, alcohol-related problems compared to those in the assessment only control condition.

**Hypothesis 3.** Participants in the DrAFT-CS + MS will demonstrate greater reductions in alcohol consumption and related problems compared to both DrAFT-CS and MS only conditions.

## CHAPTER III

### METHOD

#### **Participants**

**Initial Screening.** Participants were recruited from undergraduate psychology courses at a large Midwestern university. Potentially eligible participants were initially identified by their response to a question on a universal screening questionnaire completed by all individuals in the departmental research subject pool. Individuals who answered “yes” to a question assessing whether or not they consume alcohol were considered eligible for contact by the investigators. Eligible participants were then contacted via email through the online research system utilized by the university in order to assess their desire for participation in the current investigation. Potential participants then demonstrated their interest by replying to the recruitment email, providing both their name and phone number.

**Secondary Screening.** Interested participants were contacted via phone and assessed to determine if they met inclusion criteria. Inclusion criteria were as follows: (a) currently enrolled in college, (b) were between 18 and 25 years of age, (c) had at least one binge drinking episode in the past month (defined as 5 drinks or more in one sitting for males and 4 drinks or more in one sitting for females), (d) endorsed drinking at least 20 drinks per month on average, and (e) reported at least one negative consequence related to alcohol use within the past month. Potential participants who endorsed current treatment for an alcohol use disorder or were currently being treated for a psychological disorder were ineligible for the study. Participants were randomly assigned to one of four

conditions, either an assessment only control group, a moderation skills module only group (MS), the DrAFT-CS alone, the DrAFT-CS with Moderation Skills Module (DrAFT-CS + MS).

Initially 3,742 participants completed the departmental prescreener. From these participants, 959 participants received a recruitment email as stated above. Two hundred and twenty-one participants responded to this recruitment email expressing interest in the study. Seventy-one participants did not meet criteria for inclusions and four participants stated that they were no longer interested in participating in the study. One hundred and nineteen participants were enrolled in the study. Four participants failed to keep their appointment and were unable to be reached for rescheduling. The remaining 115 participants were randomly assigned to one of four experimental conditions prior to their arrival at the laboratory. Upon arrival, all participants were consented to treatment and completed the protocol with knowledge that they could discontinue at anytime. See Figure 1 for a participant flow diagram.

## **Materials**

Participants completed computer-based measures at baseline and at one-month follow-up. Participants completed a demographic questionnaire as well as measures assessing alcohol consumption quantity and consumption frequency. Participants also completed a questionnaire of alcohol-related drinking problems.

**Demographic Questionnaire.** Participants completed a questionnaire assessing demographic variables such as age, sex, ethnicity, year in school, association with Greek organizations, and number of individuals residing in their home.

**Daily Drinking Questionnaire (DDQ), Modified.** Participants' daily alcohol consumption was assessed using the DDQ (Collins, Parks, & Marlatt, 1985). The DDQ is a self-report measure that measures daily alcohol consumption by assessing the number of drinks and the number of hours spent drinking per day. The DDQ, Modified (Dimeff, et al., 1999) is a modified version of the original DDQ and assesses the average number of drinks consumed on a typical day for each day of the week over the past month. In addition, participants are asked to approximate their current height, weight, and indicate their gender. Participants reported the typical total number of standard drinks consumed and the duration of a drinking occasion for each day of the week. From this information, participants' total number of drinks and typical and peak BAC was assessed using the following formula:  $[(\text{number of standard drinks}/2) \times (\text{gender constant}/\text{weight})] / (.016 \times \text{number of hours of drinking episode})$ ; where gender constant equals 9.0 for women and 7.5 for men (Matthews & Miller, 1979).

**Frequency-Quantity Questionnaire (FQQ).** Frequency and amount of alcohol consumed over the past month was assessed using the FQQ (Dimeff et al., 1999). The FQQ is a three item questionnaire designed to assess the largest number of drinks consumed in a single sitting over the past month, the typical number of drinks consumed on a single weekend evening the frequency of drinking occasions over the past month, and the number drinking occasions where participants drank with the intention of getting drunk.

**Brief-Young Adult Alcohol Consequences Questionnaire (B-YAACQ).** Consequences associated with binge drinking were assessed by the B-YAACQ. Developed by Kahler, Strong, and Read (2005), the B-YAACQ is a 24-item self-report

measure designed to assess alcohol-related problems in a variety of domains. The B-YAACQ assesses problems associated with alcohol consumption (in a dichotomous format) on 8 domains including: (a) social-interpersonal consequences, b) impaired control, c) self-perception, d) self-care, e) risk behaviors, f) academic/occupational consequences, g) excessive drinking, and h) physiological dependence. Scores range from 0 to 24 where lower scores indicate fewer alcohol related problems. Kahler and colleagues suggest that scores of 10 or greater are indicative of the participant experiencing some alcohol-related problems and scores of 15 or more indicating alcohol abuse or dependence. The B-YAACQ has been shown to highly correlated with other measures of alcohol consequences such as the Rutgers Alcohol Problem Index ( $r = .78$ ; Kahler et al.).

**Timeline follow-back assessment.** In addition to the other baseline assessment measures, participants completed a timeline follow-back (TLFB) procedure during which participants will be asked to report on the number of drinks and length of the drinking occasion for each day of the previous week. Data collected from the TLFB assessment will provide information on total number of drinks over the past week, peak drinking occasion over the past week, typical BAC over the past week, and peak BAC over the past week.

## **Procedures**

Eligible participants were randomly assigned to either the assessment-only control condition, a moderation skills module only condition, a DrAFT-CS condition, or a DrAFT-CS + MS condition (see Figure B1). Upon arrival in the lab, participants provided consent to participate. Participants were informed that they were participating in

a study examining attitudes toward alcohol and will be receiving course research credit for their participation in the baseline data collection. Participants were also informed that upon completion of follow-up measures they would be placed in a drawing with all other participants who did the study to win one of two prizes consisting of a portable DVD player or an iPod Nano. Following the consent process, all participants completed baseline measures outlined above (DDQ, FQQ, B-YAACQ, TLFB). These measures were completed via computer using SurveyMonkey and were re-administered at follow-up via web link that was emailed to participants one month after completing baseline measures.

**Assessment only (AO) control condition.** Participants in the assessment only condition completed the computer-based baseline assessment measures described above. These measures were completed by all groups regardless of condition. The AO group differed only in that they did not receive the DrAFT-CS, DrAFT-CS+MS, or MS only interventions.

**Moderation skills module (MS) only.** Upon completion of baseline measures, participants in the MS only condition were directed to a MS where they viewed a video of a professor of clinical psychology with expertise in substance use disorders provide education regarding the nature and effects of alcohol and specific skills helpful for moderating its use. Topics covered included: facts regarding alcohol use on college campuses, biphasic effects of alcohol, calculating BAC, and skills that foster moderate use of alcohol (e.g., alternating between alcoholic and non-alcoholic drinks, switching to light beer, eating before and during a drinking episode, and picking quality drinks that are enjoyed over sheer quantity of drinks consumed). Following completion of the MS only, participants were free to leave the lab and were contacted via email as a prompt to



complete follow-up assessments. The MS module took approximately 30 minutes to complete.

**DrAFT-CS and DrAFT-CS + MS conditions.** Procedures for the DrAFT-CS follow those utilized by the original BASICS intervention. In addition to the baseline and follow-up dependent measures, additional questions regarding the participants' alcohol use are assessed. These questions are necessary to generate the personalized feedback, and include measures of quantity and frequency of drinking (using items adapted from the *Daily Drinking Questionnaire*, Collins, et al., 1985; and *Frequency-Quantity Questionnaire*, adapted from Cahalan & Cisin, 1968 and reported in Dimeff, et al., 1999), common problems experienced by college drinkers (*Rutgers Alcohol Problem Index*, White & Labouvie, 1989), levels of alcohol dependence (*Alcohol Dependence Scale*, Skinner & Horn, 1984), perceptions of drinking norms (*Drinking Norms Rating Form*, Baer, Stacy, & Larimer, 1991), overall levels of psychological distress (*Behavioral Health Screener*, Zygowicz & Saunders, 2003), and motivation for change in drinking behaviors (*Readiness to Change Questionnaire*, Rollnick, et al., 1992). Once participants complete these questions, they are given feedback about their drinking as it compares to a normative sample of college students. Unique to the DrAFT-CS, participants' feedback is provided and explained by an on-screen therapist who delivers the feedback in accepting and empathetic manner. Following completion of the DrAFT-CS, those in the DrAFT-CS +MS condition were directed to the computer-based moderation skills module described above.

**Follow-up assessment.** Participants in all conditions were contacted to complete follow-up assessments at four weeks post-intervention. All assessment measures were

available on-line and did not require the participants to return to the lab. Follow-up measures included those administered during baseline, the DDQ, FQQ, and B-YAACQ.

## CHAPTER IV

### RESULTS

#### **Preliminary Analyses**

**Sample Characteristics.** One hundred and fifteen participants completed baseline measures. Of these 115 participants, 110 participants completed one-month follow-up measures. Statistical analyses were performed on all participants who completed baseline and follow-up measures. There were an equal number of men and women in the study. Participants were mostly White (86.4%), underclassmen (freshmen 40.9%, sophomores 34.5%), and almost half were affiliated with Greek organizations (50.9%). Chi square tests of association were conducted to examine frequency of group membership across a variety of demographic variables. Frequency of participant group membership was non-significant for sex ( $\chi^2 = 2.70$ ,  $p = .44$ ), ethnicity ( $\chi^2 = 24.43$ ,  $p = .13$ ), academic year ( $\chi^2 = 19.42$ ,  $p = .07$ ), Greek affiliation ( $\chi^2 = 1.96$ ,  $p = .58$ ), and employment status ( $\chi^2 = 2.52$ ,  $p = .47$ ). A one-way analysis of variance (ANOVA) revealed a significant difference between groups for participant age ( $F(3, 101) = 2.79$ ,  $p = .05$ ). Post hoc analysis revealed that participants in the DrAFT-CS+MSM group ( $M = 19.96$ ,  $SD = 1.61$ ) were significantly older than participants in the MSM group ( $M = 18.92$ ,  $SD = .88$ ; see Table A1). Table A2 provides a list of means and standard deviations for outcome measures at baseline.

## Intervention Efficacy

A mixed design ANOVA was used to examine change in outcome variables from baseline to one-month follow-up between groups. Intervention effects were examined using a variety of outcome variables (listed in Table A2). These variables examined patterns of consumption as well as alcohol-related problems.

**Hypothesis 1.** Six repeated measures ANOVA's were conducted on each of the outcome variables in order to determine differences between AO, DrAFT-CS, DrAFT-CS+MS, and MS only groups. There was no significant time (baseline and follow-up) by condition (AO, DrAFT-CS, DrAFT-CS+MS, MS only) interaction for any of the six outcome variables. Analyses revealed a significant main effect for time for five of the six outcome variables (see Table A2 for means and standard deviations).

A repeated measures ANOVA was conducted to examine difference in change over time on AUDIT score. Results revealed a non-significant interaction between condition and time,  $F(3, 102) = 1.44, p = .235, \text{partial } \eta^2 = .127$ , observed power = .372. A significant main effect for time on alcohol use difficulties (AUDIT scores),  $F(1, 102) = 14.77, p < .001, \text{partial } \eta^2 = .127$ , power = .97, such that AUDIT scores decreased over time regardless of condition assignment (see Figure B2). Reliability analyses on the AUDIT items suggests that AUDIT items were correlated reasonably well given the wide range of alcohol-related constructs assessed on the measure and the limited number of items (baseline Cronbach's  $\alpha = .601$ ; follow-up Cronbach's  $\alpha = .663$ )

Similar findings were present for peak drinking occasion over the previous month. Again, there was no time by condition interaction effect,  $F(3, 106) = .898, p = .445, \text{partial } \eta^2 = .025$ , observed power = .241. A significant effect for time was observed,

$F(1, 106) = 19.67, p < .001, \text{partial } \eta^2 = .16, \text{power} = .99$ , such that number of drinks consumed on the peak drinking occasion over the past month decreased for all groups regardless of condition (see Figure B3).

There was no significant interaction for time by condition for total typical weekly drinks,  $F(3, 105) = .121, p = .948, \text{partial } \eta^2 = .003$ , observed power = .071. There was also a significant main effect for time for total typical weekly drinks  $F(1, 105) = 15.83, p < .001, \text{partial } \eta^2 = .13, \text{power} = .98$ , such that the number of total drinks consumed over a typical week decreased for all groups regardless of condition (see Figure B4).

In order to assess changes in blood alcohol concentration levels, peak BAC over a typical week and average BAC over a typical weekend were calculated. A mixed ANOVA revealed no significant interaction effect for peak BAC,  $F(3, 105) = .270, p = .847, \text{partial } \eta^2 = .008$ , observed power = .100. A significant main effect for time was observed for peak BAC,  $F(1, 105) = 20.24, p < .001, \text{partial } \eta^2 = .16$ , observed power = .99, such that peak BAC decreased over time regardless of condition (see Figure B5).

There was no significant interaction for time and condition on the average weekend BAC variable  $F(3, 104) = .134, p = .940, \text{partial } \eta^2 = .004$ , observed power = .074. A significant main effect for time  $F(1, 104) = 24.55, p < .001, \text{partial } \eta^2 = .19$ , observed power = .99 (see Figure B6). There was also a significant main effect for condition on average weekend BAC,  $F(3, 104) = 2.63, p = .05, \text{partial } \eta^2 = .07$ , observed power = .63. A Tukey HSD post hoc analysis was conducted in order to examine this effect. There was no significant differences between groups at this level; however there was a trend toward significance between the DrAFT-CS+MS and the AO groups ( $p = .06$ ). See Table A2 for differences between means.

With regard to alcohol-related consequences, there were no interaction effects for time by condition,  $F(3,104) = 1.17, p = .39, \text{partial } \eta^2 = .035$ , observed power = .307. In addition, there were no significant main effects for time,  $F(1, 104) = .74, p = .39, \text{partial } \eta^2 = .007$ , observed power = .137, on this variable (see Figure B7). Reliability analysis of the BYAACQ was conducted on the current sample. Results indicated that items were adequately correlated at baseline ( $r = .715$ ) and follow-up ( $r = .715$ ) time points.

**Hypothesis 2.** In order to examine the second hypothesis examining differences between PFI conditions and assessment only, a mixed ANOVA with planned contrasts were conducted such that DrAFT-CS and DrAFT-CS+MS were statistically collapsed into one variable (PFI) and compared to AO alone. Again, there was no significant time by condition interaction for AUDIT score,  $F(1, 102) = .000, p = .951, \text{partial } \eta^2 < .001$ , observed power = .034. Similar findings were observed for peak drinking occasion over the past month ( $F(1, 106) = 1.44, p = .233, \text{partial } \eta^2 = .013$ , observed power = .219), typical week total drinks ( $F(1, 105) = .280, p = .598, \text{partial } \eta^2 = .003$ , observed power = .042), peak BAC ( $F(1, 105) = .300, p = .586, \text{partial } \eta^2 = .003$ , observed power = .042), average weekend BAC ( $F(1, 104) = .010, p = .910, \text{partial } \eta^2 < .001$ , observed power = .035), or alcohol related consequences ( $F(1, 104) = .350, p = .558, \text{partial } \eta^2 = .003$ , observed power = .047).

There was a significant main effect contrast on average weekend BAC between PFI conditions and the AO condition,  $F(1, 104) = 5.21, p = .024, \text{partial } \eta^2 = .05$ , power = .616. Examination of this main effect suggested that participants in the in the PFI conditions reported significantly lower average weekend BAC compared to AO condition. Table A2 lists combined means and standard deviations for PFI conditions.

**Hypothesis 3.** In order to test the hypothesis that moderation skills uniquely contribute to the efficacy of a PFI, a mixed design ANOVA with planned contrasts was conducted. Specifically, DrAFT-CS and MS only conditions were statistically collapsed to compare their average effectiveness to the DrAFT-CS+MS intervention. Similar to the other analysis there were no significant interactions for time and condition observed for AUDIT scores ( $F(1, 102) = 3.42, p = .067, \text{partial } \eta^2 = .032, \text{observed power} = .448$ ), peak drinks over the past month ( $F(1, 106) = .740, p = .393, \text{partial } \eta^2 = .007, \text{observed power} = .171$ ), typical week total drinks ( $F(1, 105) = .010, p = .911, \text{partial } \eta^2 = .003, \text{observed power} = .048$ ), peak BAC ( $F(1, 105) = .350, p = .554, \text{partial } \eta^2 = .003, \text{observed power} = .048$ ), average weekend BAC ( $F(1, 104) = .350, p = .558, \text{partial } \eta^2 = .003, \text{observed power} = .047$ ), or alcohol related consequences ( $F(1, 104) = .070, p = .789, \text{partial } \eta^2 < .001, \text{observed power} = .045$ ). As with all other analyses, there was a significant main effect of time (reported above). Table A2 provides combined means and standard deviations for DrAFT-CS and MS only planned contrast.

## CHAPTER V

### DISCUSSION

The purpose of the present study was to replicate and extend previous research examining the effectiveness of a computer-based PFI. The current investigation set out to replicate findings that a computer-based PFI would lead to greater reductions in alcohol use and alcohol-related problems compared to assessment only controls. In addition, the study sought to test the unique (and possibly additive) contribution of a moderation skills module to personalized feedback interventions.

The present study sought to examine the efficacy of a computer-based PFI for reducing alcohol consumption and related problems. It was hypothesized that participants randomly assigned to a computerized PFI would report significantly greater reductions in alcohol compared to participants in an assessment only control condition. This hypothesis was tested using a mixed design ANOVA examining differences between four intervention groups (AO, DrAFT-CS, DrAFT-CS+MS, and MS only) and across baseline and one-month follow-up time points. Results did not indicate that the DrAFT-CS produce significantly greater change than AO and MS only regardless of the presence of a moderation skills module. A significant main effect of time was observed for a number of outcome variables including changes in AUDIT score, typical total drinks consumed in a week, peak occasion in the past month, average weekend BAC, and peak BAC. No



significant differences were observed for alcohol related problems. These results were surprising given previous research which found the DrAFT-CS to produce significantly greater reductions in alcohol consumption variable (Leffingwell et al., 2007; Wagener et al., under review).

Further analyses aimed at examining differences between computer-based PFI and assessment only controls yielded similar results. DrAFT-CS and DrAFT-CS+MS groups were statistically collapsed across one another and compared to AO. In addition, DrAFT-CS and MS only groups were statistically collapsed to examine the unique effect of DrAFT-CS+MS compared to similar interventions lacking the comprehensive PFI and moderation skills intervention. Results from these statistical analyses did not support previous research conducted on the DrAFT-CS that has yielded significantly greater reductions in alcohol use compared to AO (Leffingwell et al., 2007; Wagener, et al., under review).

While overwhelming support for the efficacy of computer-based PFI's was not found with the current investigation, it would be premature to assume that this particular intervention was unsuccessful. Power analyses suggest that the current sample is under powered. The magnitude of mean change may indicate that differences between groups may become observable with a larger population. Larger mean change was observed for two important consumption variables, peak drinking occasion and typical weekly drink totals. Although these differences were not statistically significant, it is worth noting their potential clinical significance.

First, larger changes in mean drinks on peak drinking occasions were observed such that participants in the DrAFT-CS+MS condition decreased the number of drinks

consumed on their heaviest drinking occasion by three drinks, compared to a mean decrease of just one drink for AO participants. Reducing alcohol consumption by three drinks could have a meaningful clinical effect for participants. Depending on the rate at which they are consuming alcohol, participants may experience reduced BAC and fewer alcohol-related consequences such as fewer fights, blackouts, risky behaviors (e.g., drinking under the influence, unplanned sexual encounters), and classes missed.

Similarly, participants in the DrAFT-CS+MS, DrAFT-CS, and MS only conditions decreased typical weekly drink totals by approximately 7 drinks compared to a reduction of approximately 4.5 drinks in the AO condition. Although not statistically significant, this discrepancy may be clinically significant for individual participants. A reduction of approximately seven drinks may result in lower BAC and fewer alcohol-related consequences (as mentioned previously). Given that peak drinking occasions tend to occur on the weekends (Del Boca, Darkes, Greenbaum, & Goldman, 2004), a reduction of 7 drinks over the course of the week may reflect a reduction in weekend drinking, but also weekday drinking. Reductions in weekday drinking may result in lower BAC on weekday drinking episodes, or may eliminate one or more weekday drinking episodes entirely. In addition to reductions in the aforementioned alcohol-related problems, participants may notice reductions in academically oriented alcohol related problems such as fewer missed classes.

Examination of the baseline and follow-up means suggest that participants are decreasing consumption. One possible explanation is for this effect is that all four groups did receive some form of intervention. While the AO group was designed to be a control group, it is possible that assessment alone may serve as an intervention. A growing body

of literature has found support for assessment alone producing changes in drinking-related outcome variables (often referred to as assessment reactivity; Moos, 2007).

Kypri, Langley, Saunders, & Cashell-Smith (2006) reported on results from a RCT trial for hazardous drinking. As a function of the intervention participants were randomly assigned to either a minimal assessment (consisting of only the AUDIT) or a more comprehensive assessment (consisting of a drinking diary, assessment of alcohol related problems, academic difficulties, and drinking norms). Results indicated that at 12-month follow-up, participants who received the more extensive assessment reported a greater reduction in AUDIT scores than those in the minimal (AUDIT only) assessment condition.

Building upon this finding, McCambridge and Day (2007) examined participants who received a general health questionnaire with a single imbedded question regarding alcohol use compared to participants who received the same health questionnaire and the full AUDIT. These participants were also aware that the study was examining alcohol use. Results indicated that participants receiving the full AUDIT displayed significantly greater reduction in several outcome variables including follow-up AUDIT score and number of days in the previous week with greater than 10 drinks consumed. While these authors embrace the potential effect of social desirability from the full AUDIT group, the data served as one of the first studies that empirically demonstrated the effect that baseline assessment may have on follow-up outcome data.

Walters, Vader, Harris, and Jouriles (2009) randomly assigned participants to receive either a minimal assessment, consisting of a single binge episode question, or a comprehensive assessment (including DDQ, AUDIT, norms, readiness to change, and

protective behavioral strategies). While this investigation found no differences between groups for average drinks per week, they did find that full assessment participants were more likely to report lower AUDIT scores, lower BAC, and use of more protective behavioral strategies.

The assessment reactivity phenomenon within alcohol intervention literature has begun to amass a significant body of literature supporting its effect on outcomes. What remain unclear are the mechanisms of this reactivity. Some researchers have suggested that assessment reactivity is related to social desirability and participants' ability to infer that for which researchers are looking (the Hawthorne Effect; McCambridge & Day, 2007). Others have examined more observable phenomena including content of assessment and quantity of assessment. Jenkins, McAlaney, and McCambridge (2009) performed a meta-analytic review of brief motivational interventions. The authors found a great deal of heterogeneity between studies regarding assessment only control conditions. Further, the investigators found little support for type of assessment only control, type of target population, or duration of study as significant predictors of outcome within assessment only groups.

One final mechanism for assessment reactivity that warrants attention is that assessments themselves may serve as interventions. As Moos (2007) acknowledged, BMI's are effective because they draw attention to an individual's pattern of drinking and the subsequent discrepancy between their drinking, their personal values, and accurate societal norms (both injunctive and descriptive). While most BMI's highlight this discrepancy through in-person or computerized feedback presented after an initial assessment, it is impossible to ignore that simply answering questions about use and

related problems draws attention to important variables such as frequency, quantity, and consequences. Regardless of these mechanisms of action, assessment reactivity is a well documented phenomenon that may have influenced current results. “Being better than assessment only conditions” remains a significant challenge for those interested in developing effective BMI’s.

### **Strengths and Limitations**

There are several limitations of note for the current investigation. As noted above, the current investigation was woefully underpowered. Time constraints and the use of four groups that was necessary for answering the research question for this investigation, made it difficult to reach the power necessary to detect small to modest effect sizes that are demonstrated in other similar studies (Borsari & Carey, 2001; Murphy et al., 2001). Continued data collection may be helpful in increasing power to better examine differences between groups. Moreover, a larger sample size would improve generalizability of findings.

A second limitation to the current study was the short follow-up period and lack of additional follow-up time points. Given restrictions on participant availability and lack of funding to reimburse participants for completing measures beyond the end of the semester, it was deemed too difficult to attempt follow-up beyond the one month follow-up utilized for this study. The largest disadvantage to using a short follow-up window is the likelihood that participants may overlap significant drinking occasions that occurred close to the baseline data collection date. Further, many measures including the AUDIT and BYAACQ, ask participants to report on use and consequences over the past year. While it is likely that participant recall of these events involves more recent episodes, it is

possible that these variables were confounded by substantial overlap in the referenced time frame.

Another limitation is the lack of a measure of protective behavioral strategies used by participants such as the Protective Behavioral Strategies Survey (PBSS; Martens et al., 2005). Given that one aim of the intervention was to examine the efficacy of a moderation skills module, it would seem reasonable to include a measure that examines protective behavioral strategies that promote moderation. Inclusion of a scale, such as the PBSS, would provide information on change over time and between groups on skills used to moderate use (e.g., alternating between alcoholic and non-alcoholic drinks, avoiding drinking games, using a designated driver; from Martens et al.). It is possible that participants may have reported significant increases in protective behaviors compared to assessment only without noticing significant changes in consumption and alcohol related problems by one month follow-up.

One final limitation of the current investigation was the lack of a participant satisfaction survey (PSS). Other similar studies have incorporated a PSS in order to examine participant preference for the different interventions (e.g., Borsari & Carey, 2001; Wagener et al., under review). Given the lack of significant differences between groups, estimates of group differences with larger cell sizes is purely speculative. It must be considered that these differences between groups would not reach significance. Thus, having a measure of participant preferences may be helpful in determining the utility of providing assessment only, as a stand-alone intervention, or opting for a slightly longer and more comprehensive program like the DrAFT-CS.

Despite the limitations, there exist two significant strengths of the current study. First, this is the first study, to date, to empirically examine the unique contribution of a moderation skills module added to a PFI. Although the results suggest no significant differences between groups, visual analysis of the group means has demonstrated slightly more improvement in alcohol consumption variables compared to assessment only, with even smaller differences observed between PFI with and without a moderation skills module. Second, if these differences truly do not exist in the population, the significant main effect observed for time in lieu of significant group differences, provides additional support for the existence of assessment reactivity and supports the need for further research in the area of improvements made in assessment only control conditions.

### **Future Directions**

Given the aforementioned limitations, future research should examine differences between similar groups with larger cell sample sizes. If differences are observed with larger sample sizes, additional research would be appropriate in order to replicate those findings. In addition, inclusion of measures designed to assess protective behavioral strategies would be helpful to examine differences in skill acquisition between the different intervention conditions. For example, it is possible that no differences would be observed between DrAFT-CS and DrAFT-CS+MS groups on consumption variables and alcohol related problems, but there may be differences in strategies utilized or the quantity of strategies utilized to produce similar results. This may support the use of MS modules for increasing a behavioral repertoire that promotes harm reduction.

Finally, given the response observed from the AO group future research should focus on identifying assessment characteristics that are resistant to assessment reactivity.

For example, research could focus on dismantling assessment batteries to determine at what level assessment reactivity it no longer observed. Also, research could examine various degrees of assessment imbedded into non-alcohol-related assessment instruments in order to determine if assessment reactivity is affected by how blatant the battery is toward measuring a specific area or construct. Research lines such as these would further knowledge regarding assessment reactivity characteristics.



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# APPENDIX A

## TABLES

Table A1.

### *Demographics*

Demographic	M(SD)	$\chi^2$	<i>p-value</i>
Sex		2.70	.440
Ethnicity		24.43	.125
Academic Year		19.42	.070
Greek Affiliation		1.96	.582
Employment Status		2.52	.473

Age	Condition	M(SD)
	AO	19.40(1.32)
	DrAFT-CS	19.72(1.49)
	DrAFT-CS+MS	19.96(1.61)*
	MS only	18.92(1.40)*

*Note.* \* significant differences between groups  $M_{diff} = 1.05$  ( $SE = 0.38$ ),  $p = .037$ .

Table A2.

*Baseline and Follow-up Means & Standard Deviations for all Conditions and Planned Contrasts*

Condition	AUDIT		BYAACQ		Peak Month	
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>
AO	13.92(5.28)	12.00(4.46)	11.00(3.33)	11.00(4.09)	12.98(5.19)	12.02(5.08)
DrAFT-CS	13.07(4.61)	11.86(4.94)	10.17(4.47)	10.47(4.16)	12.23(4.40)	10.57(5.07)
DrAFT-CS+MS	13.71(5.50)	11.21(4.72)	11.54(3.64)	10.25(4.66)	13.02(4.69)	10.07(4.91)
MS only	14.08(4.23)	13.73(5.49)	12.00(3.66)	11.85(4.19)	13.80(4.60)	11.43(5.06)
Combined PFI	13.39(5.06)	11.54(4.83)	10.85(4.05)	10.36(4.41)	12.63(4.54)	10.32(4.99)
Combined DrAFT- CS/MSonly	13.57(4.42)	12.79(5.22)	11.08(4.07)	11.16(4.17)	13.01(4.50)	11.00(5.07)

Condition	Typical Week Total		Peak BAC		Average BAC	Weekend
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>
AO	25.12(14.28)	20.48(12.09)	.24(.18)	.20(.13)	.18(.14)	.14(.09)
DrAFT-CS	27.69(22.32)	20.79(18.09)	.22(.15)	.14(.10)	.15(.12)	.10(.07)
DrAFT-CS+MS	24.00(13.43)	17.43(14.04)	.18(.12)	.13(.10)	.12(.09)	.08(.06)
MS only	28.67(13.66)	21.56(11.45)	.25(.17)	.18(.11)	.18(.13)	.12(.09)
Combined PFI	25.85(17.87)	19.11(16.06)	.20(.14)	.14(.10)	<b>.14(.11)</b>	<b>.09(.07)</b>
Combined DrAFT- CS/MSonly	28.18(17.99)	21.17(14.77)	.23(.16)	.16(.10)	.17(.13)	.11(.08)

*Note.* Bold type indicates a significant difference from baseline to follow-up ( $p < .05$ ).

## APPENDIX B

### FIGURES

Figure B1. Participant Flow Chart

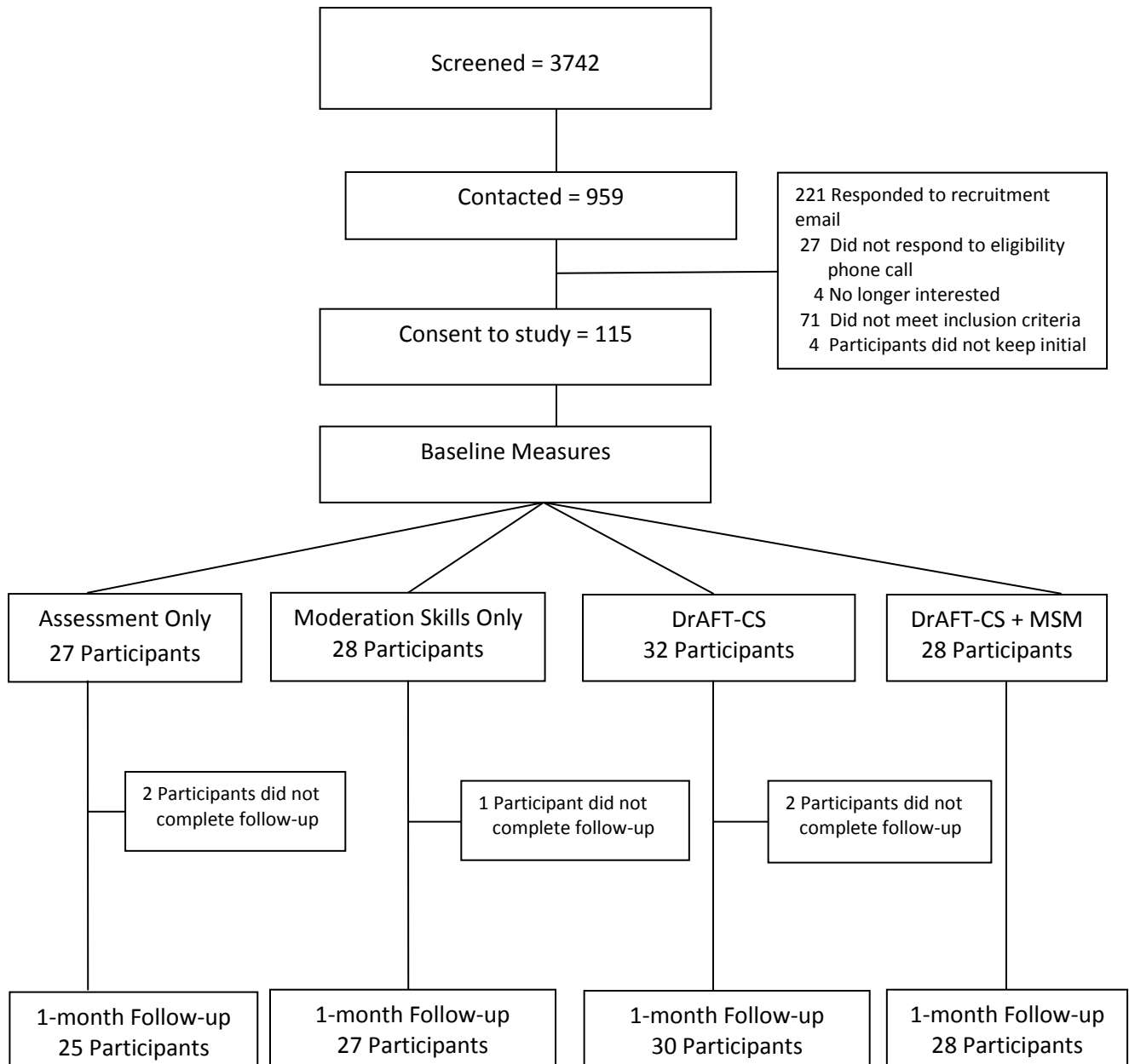


Figure B2. Observed Means at Baseline and Follow-up for AUDIT scores

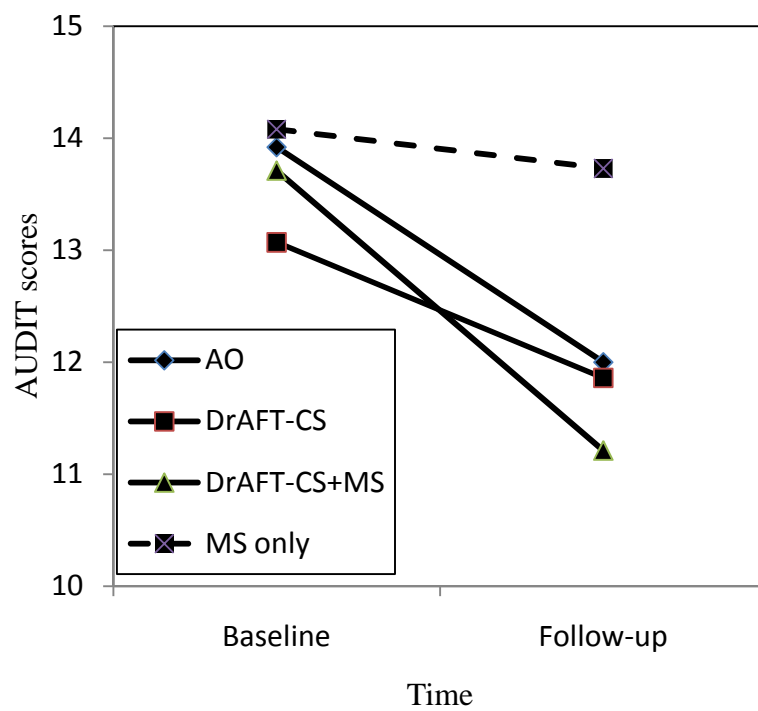


Figure B3. Observed Means at Baseline and Follow-up for Peak Drinks – Past Month

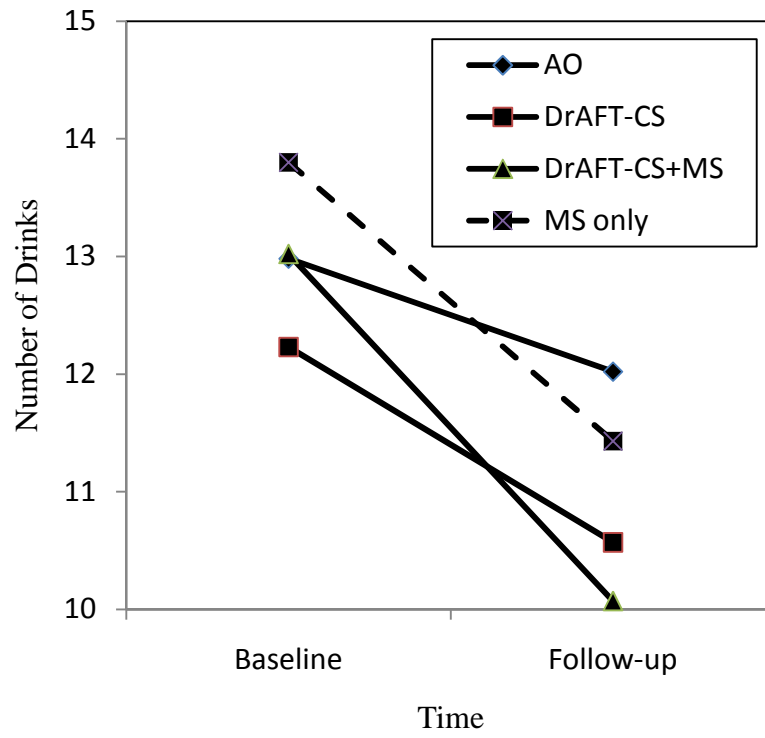


Figure B4. Observed Means at Baseline and Follow-up for Typical Week Total Drinks

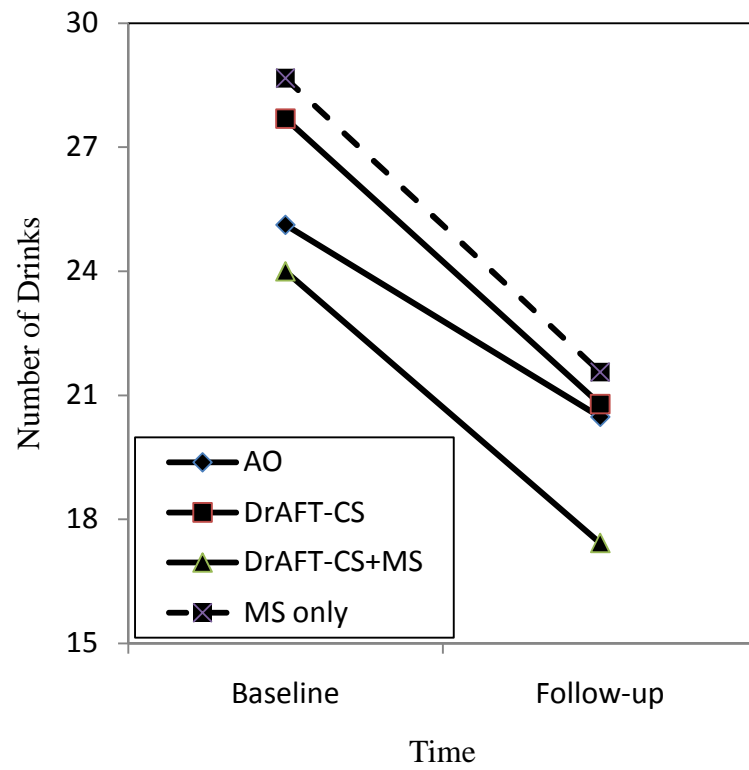


Figure B5. Observed Means at Baseline and Follow-up for Peak BAC

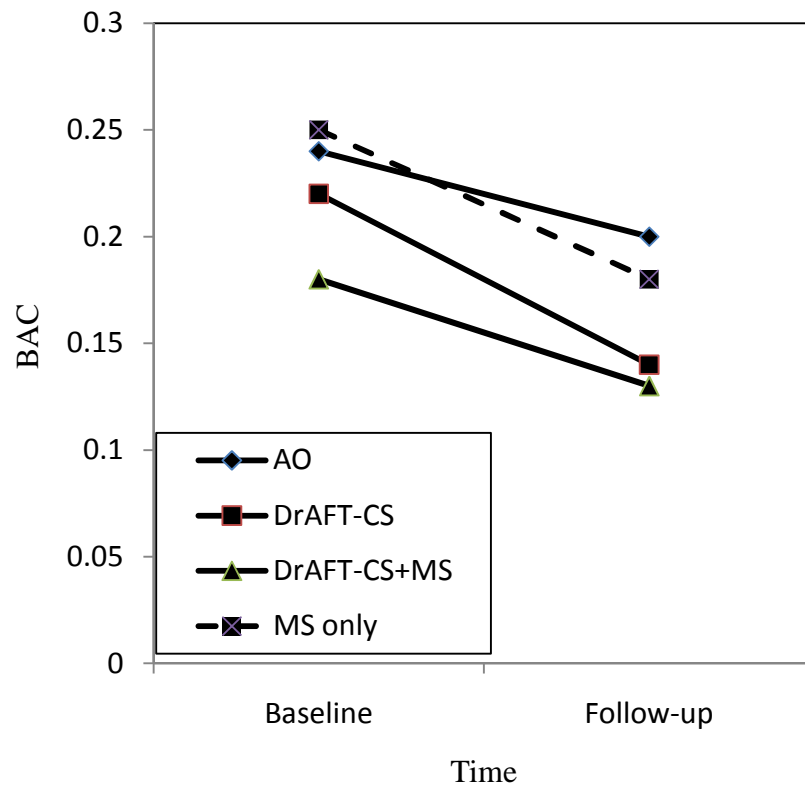




Figure B6. Observed Means at Baseline and Follow-up for Average Weekend BAC

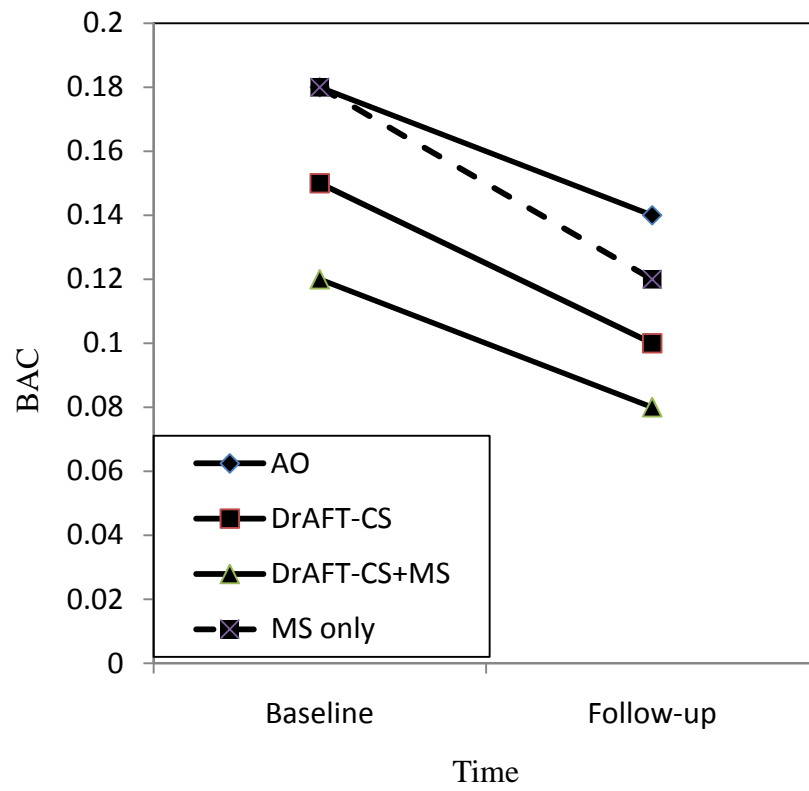
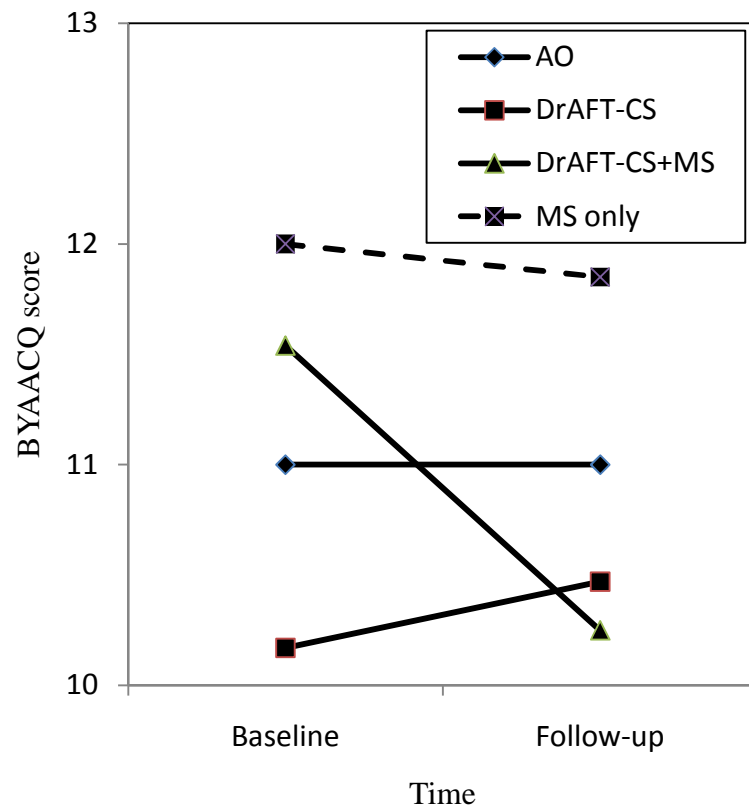


Figure B7. Observed Means at Baseline and Follow-up for BYAACQ scores



## VITA

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Candidate for the Degree of

Doctor of Philosophy

Dissertation: A RANDOMIZED CONTROLLED TRIAL COMPARING A  
COMPUTER-BASED PERSONALIZED FEEDBACK INTERVENTION  
WITH AND WITHOUT A MODERATION SKILLS MODULE

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Pages in Study: 67

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Major Field: Clinical Psychology

Scope and Method of Study:

Personalized Feedback Interventions (PFI's) have been supported in the literature for their effectiveness in reducing alcohol consumption and related consequences for college students. More recently, these interventions have been adapted to computer-based programs designed to disseminate these interventions a great number of individuals while limiting reliance on trained interventionists. While some of these PFI's include skills for moderating use, others have not included such modules. Both forms of the intervention have been shown to be effective. To date, there has not been a study to systematically examine the unique, or additive, contribution of skills modules. The current study sought to replicate and extend previous research on a computer-based PFI in order to test the utility of moderations skills (MS) modules. One hundred and fourteen participants were randomly assigned to an assessment only, a PFI, a PFI plus MS, or a MS only condition. Consumption and consequences variables were obtained at baseline and at one month follow-up. It was hypothesized that participants receiving PFI or PFI plus MS would demonstrate significantly greater reductions in alcohol use and related consequences compared to assessment only control groups, and that participants completing PFI plus MS would demonstrate significantly greater reductions in alcohol use and related consequences than all other groups.

Findings and Conclusions:

Results from the current study failed to support the utility of MS when combined with PFI's. Further, no significant interactions of time and condition were observed for any of the outcome variables. Results from the current investigation should be interpreted with caution given the small sample size and statistical power. Implications and future directions are discussed.

ADVISER'S APPROVAL: Thad R. Leffingwell, Ph.D.

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