AN ECOLOGICAL MOMENTARY ASSESSMENT OF SELF-REGULATION, DIETARY RESTRICTION, AND ALCOHOL USE AMONG COLLEGE WOMEN

A dissertation submitted

to Kent State University in partial

fulfillment of the requirements for the

degree of Doctor of Philosophy

by

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CHAPTER I

INTRODUCTION

Dietary restraint is common among women, particularly during adolescence and young adulthood (Keel, Baxter, Heatherton, & Joiner, 2007). In a sample of college women, roughly 50% reported current attempts to lose weight (Dams-O’Connor, Martens, & Anderson, 2006). Due to the ubiquitous nature of dietary restraint, researchers have examined its association with potential adverse outcomes, such as binge eating. In a seminal review, Polivy and Herman (1985) posited that dietary restraint is causally related to subsequent binge eating through a physiological and cognitive mechanism. Dietary restraint, also known as chronic dieting (Heatherton & Polivy, 1992), refers to the chronic monitoring and restriction of one’s caloric intake for the purpose of weight loss or weight maintenance (Herman & Mack, 1975). Due to the chronic monitoring and restriction of one’s caloric intake, dietary restraint results in physiological hunger and psychological deprivation, subsequently increasing the risk of binge eating (Polivy & Herman, 1985). Research has also supported dieting behavior as a predictor of the onset of binge eating (Stice, 2001; Stice & Agras, 1998), and thus is central to the maintenance of eating pathology (Stice, 2002). In addition to the higher prevalence of dietary restraint among women (Keel et al., 2007), eating disorders (EDs) are also more prevalent among women than men. Within a given year, the prevalence of anorexia nervosa (AN) is .4%, while the prevalence of bulimia nervosa (BN) and binge eating disorder (BED) is higher (1 to 1.5% and 1.6%, respectively) (American Psychiatric Association, 2013).
Apart from focusing on individuals who engage in subclinical levels of eating pathology, namely dietary restraint and binge eating, researchers have started to identify a group of individuals who spend a substantial amount of time devoted to the preparation and consumption of healthy food. This type of eating behavior has been referred to in the literature as “orthorexia nervosa.” In the general population, the prevalence of orthorexia nervosa is 6.9% (Donini, Marsili, Graziani, Imbraile, & Cannella, 2004). Given the obsessional nature associated with the selection and preparation of healthy food among individuals with orthorexia nervosa, many individuals who engage in this eating behavior also engage in severe dietary restraint (Bratman & Knight, 2000).

Severe dietary restraint, such as fasting, can be used as a compensatory strategy. Fasting refers to the lack of food consumption for more than eight waking hours (Fairburn & Beglin, 1994). According to Fairburn (2008), there is a negative feedback loop between binge eating and the use of subsequent compensatory behaviors. Thus, individuals who perceive a loss of control following a binge eating episode may utilize compensatory strategies in order to regain control of their eating behavior. The use of these compensatory strategies is highly prevalent among college women. Between 1990 and 2004, 7.7% of college women reported engaging in fasting, while 1.8% engaged in vomiting, 1.1% used laxatives, 1.6% used diuretics, and 18.2% engaged in excessive exercise (Crowther, Armey, Luce, Dalton, & Leahey, 2008).

Alcohol consumption is another prevalent behavior among college-aged individuals, with roughly 40% of college students reporting binge drinking or heavy episodic drinking (Dawson, Grant, Stinson, & Chou, 2004). These rates of heavy drinking are higher among college students as compared to their same-aged non-college peers (Dawson et al., 2004; O’Malley & Johnston, 2002). Using a daily diary methodology, several studies have found that on average, college
women exceed the gender-specific criteria for binge drinking or heavy episodic drinking (Luce, Crowther, Leahey, & Buchholz, 2013; Neal & Carey, 2007; Neighbors et al., 2011), defined as consuming four or more drinks in one sitting (Wechsler, Dowdall, Davenport, & Rimm, 1995). These high rates of heavy drinking are problematic, given that higher levels of alcohol consumption are associated with more alcohol-related consequences, such as missing classes, engaging in unplanned sexual activity, and legal problems (Perkins, 2002; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994; Wechsler et al., 1995). Between 1998 to 2004, the rates of experiencing an alcohol-related consequence among college students aged 18 to 24 have increased (Hingson, Zha, & Weitzman, 2009).

Taken together, dietary restraint (Keel et al., 2007) and alcohol consumption (Dawson et al., 2004) are prevalent behaviors among young adults. Furthermore, these behaviors are associated with adverse outcomes, including binge eating (e.g., Polivy & Herman, 1985; Stice, 2001; Stice & Agras, 1998) and risky drinking behaviors (e.g., Perkins, 2002; Wechsler et al., 1994; Wechsler et al., 1995). In this Introduction, I will first review the literature that has examined the co-occurrence between dietary restraint and alcohol use. Second, I will reference the literature that has examined decreased caloric intake on drinking days. Third, I will discuss the research that has examined changes in an individual’s behavior in anticipation of and following their intended alcohol consumption, referred to as “drunkorexia” (Piazza-Gardner & Barry, 2013). Lastly, I will provide information that has examined alcohol as a disinhibitor of dietary restraint.

**Overlap between disordered eating and alcohol use**

Given the high prevalence of dietary restraint (Keel et al., 2007) and alcohol consumption (Dawson et al., 2004), research has examined the comorbidity between EDs and alcohol use
disorders (AUDs). Gadalla and Piran (2007) conducted a meta-analysis to examine the comorbidity between EDs and AUDs, with a positive effect size indicating a stronger relationship between EDs and AUDs. Results found a small positive effect size for the following diagnoses: BN/bulimic behavior and an AUD \( (d = .46, p < .001) \), eating disorder not otherwise specified (EDNOS) and an AUD \( (d = .41, p < .001) \), and BED and an AUD \( (d = .39, p < .01) \). The relationship between AN and an AUD was nonsignificant \( (d = .09, p > .05) \). These authors also found a significant positive relationship between purging and an AUD \( (d = .41, p < .01) \) and between restriction or dietary restraint and an AUD \( (d = .13, p < .001) \), though the latter did not reach the conventional cut-off for a small effect size \( (i.e., d = .20; \text{Cohen, 1992}) \).

Bulik and colleagues (2004) conducted a large multi-site study to examine the prevalence of AUDs among women with clinical levels of eating pathology. Results of this study indicated that alcohol abuse was more prevalent among individuals with BN as compared to individuals with AN or those with a history of both AN and BN. Additionally, the prevalence of alcohol dependence was higher among individuals with BN and those with a history of both AN and BN as compared to individuals with only AN. Overall, these studies suggest that AUDs were more prevalent or tended to co-occur more often among women with EDs along the binge spectrum \( (i.e., \text{BN and BED}) \) as compared to women with EDs along the restraint spectrum \( (i.e., \text{AN and dietary restraint}) \). One explanation for these findings is that a lack of impulse control may underlie both eating behavior and drinking behavior. For example, research has examined facets of impulsivity in relation to these behaviors, and has found that one facet, negative urgency, had a positive association with disordered eating and problem drinking (Fischer, Anderson, & Smith, 2004). An alternative explanation is restrained eaters are occasionally effective at maintaining
their dietary rules and regulating other behaviors (Lowe, 1993), such as their alcohol consumption.

Researchers have also investigated the co-occurrence of dietary restraint and alcohol consumption among non-clinical samples. Several cross-sectional studies have found that dietary restraint is positively related to the frequency of heavy drinking (Krahn, Kurth, Demitrack, & Drewnowski, 1992; Krahn, Kurth, Gomberg, & Drewnowski, 2005; Stewart, Angelopoulos, Baker, & Boland, 2000), and drinking quantity (Buchholz, Williams, & Crowther, 2012). Apart from chronic dieting, women who reported dieting to lose weight were more likely to be classified as a binge drinker than a non-binge drinker (Barry & Piazza-Gardner, 2012). Thus, women who report greater caloric restriction drink more frequently and consume more alcohol than women who are less likely to restrict their caloric intake. Furthermore, research has found that dietary restraint is positively related to alcohol-related problems (Buchholz et al., 2012; Krahn et al., 2005), suggesting that women who report greater caloric restriction experience more problems after drinking than women who report less dietary restraint.

One construct that may be important to our understanding of the relationship between dietary restraint and alcohol consumption is drinking intent. Approximately 45% of college women who consumed alcohol in the past-month reported restricting their food, fat, or caloric intake on days they intend to drink alcohol (Giles, Champion, Sutfin, McCoy, & Wagoner, 2009). Using a daily diary methodology, Luce and colleagues (2013) found that restrained eaters had fewer eating episodes than unrestrained eaters on days they intended to drink alcohol. However, on days they intended to drink alcohol, there were no differences between restrained eaters and unrestrained eaters in the total number of calories consumed. These results suggest
that drinking intent may influence the eating behavior of women who engage in chronic
monitoring of their caloric intake (i.e., restrained eaters).

Research has found that students who restricted their caloric intake on drinking days also
drank more frequently than those who did not restrict their caloric intake (Burke, Cremeens,
Vail-Smith, & Woolsey, 2010). In particular, women who restricted their caloric intake on
drinking days were 137% more likely to get drunk in a typical week as compared to women who
did not restrict their caloric intake on drinking days. In addition, women who restricted their
caloric intake on days they intend to drink were at a higher risk of experiencing alcohol-related
problems as compared to women who did not restrict their caloric intake. Specifically, these
women were at a heightened risk of experiencing memory loss, physical injury, engaging in
unprotected sex, and being taken advantage of sexually (Giles et al., 2009). Overall, these
studies suggest on days women restrict their caloric intake before drinking, they consume more
alcohol, drink more frequently, and are at an increased risk of experiencing problems after
drinking. Given these associated consequences, it is imperative to examine factors that may lend
explanation to why these women are at a heightened risk of increased alcohol consumption and
problems on days they intend to drink alcohol.

**Drunkorexia**

To clarify the relationship between eating and drinking behavior on drinking days,
researchers have recently begun to examine the behaviors individuals engage in in anticipation of
(Burke et al., 2010) and following their intended alcohol consumption (Bryant, Darkes, & Rahal,
2012). This body of research has been referred to by the term “drunkorexia” (Piazza-Gardner &
Barry, 2013) and refers to the use of techniques to manage one’s weight, in order to counter-
balance the calories consumed from alcohol. In particular, “drunkorexia” includes skipping
meals, purging after consuming food, and exercising before and/or after drinking (Piazza-Gardner & Barry, 2013).

Peralta (2002) examined the behaviors individuals engaged in when drinking alcohol to reduce the total number of calories consumed. Using focus groups of college students and qualitative analyses, four primary themes emerged. First, students altered their typical eating patterns by either skipping meals and/or eating less than usual. Second, students consumed fewer alcoholic beverages or selected alcoholic beverages with fewer calories. Third, students reported exercising before and/or after drinking alcohol. Lastly, students reported engaging in self-induced vomiting to rid excess calories they consumed while drinking.

Results indicated that roughly 18% of college students changed their eating habits on drinking days. In addition, women were two times more likely than men to engage in the four aforementioned behaviors. Specifically, 29.7% of women reported changing their eating habits, 27% reported changing their drinking preferences, 10.8% reported using exercise, and 5.4% reported engaging in purging (Peralta, 2002). Although this study paved the way for current research on “drunkorexia” (Piazza-Gardner & Barry, 2013), several limitations exist. First, this study used a qualitative analysis, thus limiting the ability to quantify this pattern of relationships. Second, this sample of students had a low rate of drinking behavior, with only 9% of women reporting that they engaged in binge drinking. This is much lower than the national average, i.e., that 40% of college students engage in binge drinking (Dawson et al., 2004), and thus may not generalize well to the typical collegiate environment.

Bryant and colleagues (2012) conducted a follow-up study to Peralta (2002) in order to examine the prevalence of specific behaviors that college students engage in at three time points: prior to drinking, while drinking, and following a drinking episode. Women were more likely
than men to consume low calorie food before drinking, eat less than usual before drinking, eat less to get drunk more quickly, eat low calorie foods while drinking, eat low calorie foods after drinking, and skip meals after drinking. An examination of the explanations individuals provided for restricting their caloric intake on drinking days may lend explanation to the higher prevalence of these behaviors among women than men. Using a representative sample of college students, Giles and colleagues (2009) concluded the most common reasons for restricting one’s intake on drinking day were due to weight concern, to get drunk, and to avoid getting sick. Overall, this suggests that women were more likely to alter their eating patterns to compensate for the calories they consumed while drinking. Given that alcohol is a calorically-dense beverage (Dennis, Flack, & Davy, 2009) and concerns about one’s appearance are normative among women (Rodin, Silberstein, & Striegel-Moore, 1985), these results are not surprising.

Burke and colleagues (2010) examined differences in the frequency of drinking between students who reported restricting their caloric intake in anticipation of their alcohol consumption and those who did not report restricting their caloric intake. Results indicated a significant difference between groups for frequency of drinking, ($\chi^2 = 47.66, p < .01$). Among students who restricted their caloric intake, 11% drank alcohol 1 to 2 days in the past month, 23% drank alcohol 3 to 5 days, 25% drank alcohol 6 to 9 days, 30% consumed alcohol between 10 to 19 days in the past month, while 11% drank alcohol 20 or more days. Meanwhile, among students who did not restrict their caloric intake, 25% drank alcohol 1 to 2 days, 26% drank alcohol 3 to 5 days, 26% drank alcohol 6 to 9 days, 20% drank alcohol 10 to 19 days, and 3% drank alcohol 20 or more days in the past month. In other words, individuals who restrict their intake drank more frequently than those who do not.
Furthermore, results indicated a significant difference between groups for binge drinking, ($\chi^2 = 36.86, p < .01$). Students who restricted their caloric intake were also more likely to binge drink, with 10% reported binge drinking 1 to 2 days in the past month, 13% reported binge drinking 3 to 5 days, 23% reported binge drinking 6 to 9 days, 33% reported binge drinking 10 to 19 days of the past month, and 21% reported binge drinking 20 or more days. Meanwhile, among students who did not report restricting their caloric intake, 18% reported binge drinking 1 to 2 days, 22% reported binge drinking 3 to 5 days, 26% reported binge drinking 6 to 9 days in the past month, 20% reported binge drinking 10 to 19 days, and 13% reported binge drinking 20 or more days in the past month. Thus, individuals who report restricting their caloric intake are more likely to binge drink at higher frequencies than those who do not report restricting their caloric intake. When students report restricting their caloric intake before drinking, they are not only likely to drink more frequently, but they also consume higher quantities of alcohol (Burke et al., 2010).

**Alcohol as a disinhibitor of dietary restraint**

Given that women who are concerned with their weight and appearance have rigid rules about the appropriate types and amounts of food to consume (Fairburn, 2008) and alcohol is a calorically dense beverage (Dennis et al., 2009), several studies have examined alcohol as a disinhibitor of dietary restraint. Disinhibition refers to the abandonment of one’s caloric restraint due to a perceived violation of one’s dietary rules, which leads to an increase in the likelihood of subsequent overeating (e.g., Herman & Mack, 1975; Herman & Polivy, 2004). In other words, does the consumption of alcohol lead to increased caloric intake after drinking, particularly among individuals who report a greater intention to restrict their caloric intake? This research
has yielded inconsistent findings (Buchholz, Luce, et al., 2015; Polivy & Herman, 1976a, 1976b).

In their first study, Polivy and Herman (1976b) found a significant interaction between dietary restraint and alcohol condition (i.e. placebo versus alcohol). After consuming alcohol, restrained eaters ate less after drinking while unrestrained eaters ate more after drinking. However, participants in the alcohol condition were not told that they had consumed alcohol, and thus it was unclear whether the expectancy of consuming alcohol impacted their results. In a subsequent study (Polivy & Herman, 1976a), these authors modified their original lab paradigm by using a 2 (restrained versus unrestrained) x 2 (placebo versus alcohol) x 2 (informed consumed alcohol versus informed consumed Vitamin C) design. When told they had consumed alcohol, restrained eaters who drank alcohol consumed more food than restrained eaters who drank a placebo. In contrast, unrestrained eaters consumed less food after drinking alcohol as compared to the placebo. However, given that participants were administered a standard dose of alcohol in a laboratory setting, these results may not generalize to their natural environment.

Buchholz, Luce, and colleagues (2015) examined whether consuming alcohol disinhibited dietary restraint using a daily diary methodology. Initial analyses examining the interaction of group (i.e., restrained versus unrestrained eaters) and estimated blood alcohol concentration (eBAC) levels found that restrained eaters consumed fewer calories after drinking than unrestrained eaters at higher estimated blood alcohol (eBAC) levels. Subsequent analyses added negative affect and found restrained eaters consumed more calories after drinking than unrestrained eaters at higher eBAC levels, at both low and high levels of negative affect. These results suggest that negative affect may be important to our understanding of the relationship between dietary restraint and subsequent overeating after drinking. These results are consistent
with earlier laboratory research by Polivy and Herman (1976a), which found that restrained eaters ate more after drinking as compared to unrestrained eaters. Thus, negative affect may disinhibit dietary restraint, which is consistent with theory and research indicating that negative affect may trigger binge eating (Haedt-Matt & Keel, 2011; Heatherton, Polivy, & Herman, 1990; Stice, 2001).

Overall, the following information can be gleaned from the existing body of literature. First, dietary restraint often co-occurs with alcohol use, which increases the likelihood of experiencing subsequent alcohol-related problems among individuals who report greater dietary restraint (Buchholz et al., 2012). Second, individuals are more likely to restrict their caloric intake on days they intend to drink alcohol versus days they do not intend to drink. Third, the reasons that women provide for restricting their caloric intake on drinking days, including weight concerns and to get drunk (Giles et al., 2009) may help to identify which individuals are more likely to restrict their caloric intake on days they intend to drink. Fourth, women who engage in dietary restraint may consume more calories due to two potential mechanisms- increased alcohol consumption and increased negative affect (Buchholz, Luce, et al., 2015; Polivy & Herman, 1976a). One construct that may have relevance to the co-occurrence between eating and drinking behavior is self-regulation.

**Self-regulation**

Self-regulation theory has been applied to a myriad of behaviors, such as substance abuse, EDs, and lack of exercise, in order to understand how people manage and control their behavior (Baumeister, 2003). Self-regulation is purported to operate according to a feedback loop with three distinct phases (Baumeister & Heatherton, 1996). First, an individual develops standards for his/her ideal behavior. Second, the individual monitors his/her actual behavior and
makes comparisons to his/her ideal behavior. Lastly, if discrepancies are found between an individual’s actual and ideal behavior, he/she must resolve the discrepancy by changing his/her behavior or self-regulation failure will occur. For example, in the first phase, a woman engaging in dieting will develop specific dietary rules to monitor her caloric intake, such as limiting the total number of calories she consumes to 1700 kcal per day and removing ‘forbidden foods’ from her diet such as cake and ice cream. Second, she will monitor her eating behavior by calculating the total number of calories she consumes each day and her consumption of ‘forbidden foods’ using a food diary. Third, she will compare her actual eating behavior to her ideal behavior to identify any discrepancies. If she consumes more than 1700 kcal each day, she may resolve this discrepancy by engaging in compensatory strategies to remove excess calories that she consumed, and/or engage in further overeating due to a violation of her dietary rules, known as the “what the hell effect” (Herman & Polivy, 2004). Two distinct processes may explain self-regulation failure, namely misregulation and underregulation. Underregulation refers to the failure to exert control over one’s behavior, while misregulation refers to the misguided efforts to control one’s behavior (Baumeister & Heatherton, 1996).

The strength model of self-regulation (e.g., Baumeister, 2003; Baumeister & Heatherton, 1996) may lend explanation to difficulty in controlling one’s behavior. According to the strength model of self-regulation, self-regulation is a limited resource that can become temporarily depleted by simultaneous demands on its resources. As a result of diminished resources, an individual is less capable of regulating his/her behaviors in other areas. Several individual difference factors may explain why some individuals are better able to regulate his/her behavior than others. First, individuals differ in the size of their self-regulatory capacity. Due to these differences, some individuals are at an increased susceptibility to experience self-regulatory failure.
failure than others, due to simultaneous demands that deplete their resources. Second, each behavior requires a specific amount of self-regulatory resources, with stronger impulses requiring more resources than weaker ones (Baumeister, Bratslavasky, Muraven & Tice, 1998). For example, a woman engaging in dieting may utilize more self-regulatory resources for monitoring her caloric intake, which would detract from her ability to monitor other behaviors, such as the time she spends completing academic assignments.

**Self-regulation and alcohol-related behaviors**

Early theories laid the foundation for current research on the relationship between self-regulation and alcohol consumption, due to their examination of factors that may explain an individual’s difficulty with regulating their alcohol consumption. According to the Abstinence Violation Effect (Marlatt & Gordon, 1980), individuals who violate a self-imposed limit on their alcohol intake are at a heightened risk of consuming large amounts of alcohol. Collins (1993) refined this theory by adding drinking restraint to develop the Limit Violation Effect (LVE). According to the LVE, individuals who violate self-imposed drinking limits experience increased distress and guilt. To cope with their increased distress, these individuals subsequently increase their alcohol consumption. Using ecological momentary assessment (EMA), Muraven, Collins, Morsheimer, Shiffman, and Paty (2005a, 2005b) conducted a series of studies to investigate the LVE. One study (2005b) found that individuals who violated self-imposed drinking limits experienced more guilt, which led to increased alcohol consumption, intoxication, and further limit violations. This pattern was strongest among individuals who made internal attributions for their limit violations as well as restrained drinkers (2005a).

Extending this line of research to the examination of self-regulation, cross-sectional (e.g., Carey, Neal, & Collins, 2004; D’Lima, Pearson, & Kelley, 2012; Neal & Carey, 2005) and
prospective research (Hustad, Carey, Carey, & Maisto, 2009) has generally found a
nonsignificant relationship between self-regulation and alcohol consumption. These results were
supported by a recent meta-analysis (Buchholz, Crowther, & Updegraff, 2015), which examined
the magnitude of the relationship between self-regulation and alcohol use, and found a small and
non-significant weighted mean effect size ($g = -.01, p = .90$) for the relationship between self-
regulation and alcohol use. Furthermore, research has examined the relationship between self-
regulation and alcohol-related problems and has yielded fairly consistent findings. Several
authors have found a negative relationship between self-regulation and alcohol-related problems
using cross-sectional (e.g., Carey et al., 2004; D’Lima et al., 2012) or prospective designs (e.g.,
Hustad et al., 2009; Neal & Carey, 2007), suggesting that individuals with higher levels of self-
regulation experience fewer alcohol-related problems. In their meta-analysis, Buchholz,
Crowther, and Updegraff (2015) found a moderate negative weighted mean effect size for the
relationship between self-regulation and alcohol-related problems ($g = -.49, p < .0001$),
suggesting that individuals with higher levels of self-regulation experience fewer alcohol-related problems.

**Self-regulation and eating behaviors**

Self-regulation theory has been applied to eating behaviors in order to understand dieting.
Thus, self-regulation failure refers to difficulties in regulating one’s caloric intake, leading to
overeating (Herman & Polivy, 2004). Research has found that individuals with EDs utilize more
self-regulatory strategies to manage their weight than those without EDs (Kitsantas, Gilligan, &
Kamata, 2003). Therefore, women who are more likely to engage in dieting for the purposes of
weight loss or weight maintenance are at a higher risk of experiencing self-regulation failure
(i.e., overeating) than their peers who are less likely to utilize dietary restraint. A recent meta-
analysis by Buchholz, Crowther, and Updegraff (2015) found a significant negative effect size between self-regulation and dietary restraint ($g = -0.40, p < .0001$), suggesting that individuals with higher self-regulation engage in less dietary restraint.

To examine the self-regulation of eating behavior, the majority of research has utilized a laboratory design with a caloric preload in which an individual completes taste-test ratings of various foods, thus violating his/her self-imposed dietary rules, and has the opportunity to consume food ad libitum, which produces subsequent overeating. In a seminal study, Herman and Mack (1975) found that restrained eaters increased their subsequent caloric intake after consuming a highly caloric preload, while unrestrained eaters decreased their subsequent caloric intake. These authors referred to this as the “disinhibition effect.” Other researchers have used a cue exposure paradigm, in which an individual is exposed to a food item through various cues and asked to complete a subsequent taste-test procedure. Several studies have concluded that food exposure leads to increased food consumption (e.g., Coelho, van den Akker, Nederkoorn, & Jansen, 2012; Fedoroff, Polivy, & Herman, 2003; Ferriday & Brunstrom, 2008), while others have found that exposure leads to decreased food consumption (e.g. Houben & Jansen, 2011; Nederkoorn & Jansen, 2002; Papies & Hamstra, 2010), or no relationship (Ferriday & Brunstrom, 2011; Larsen, Hermans, & Engels, 2012).

Dietary restraint may strengthen the relationship between cue exposure and overeating. According to the counteractive-control theory (Trope & Fishbach, 2000), self-control has played a crucial role in the relationship between cue exposure and subsequent behavior. This theory posits that exposure to a tempting cue (i.e., food) can strengthen the importance of a long-term goal or behavior (i.e., dieting), and has been applied to understand the regulation of eating behavior. Restrained eaters who were exposed to a food cue reported higher dieting intentions.
than restrained eaters who were not exposed to a food cue (Fishbach, Friedman, & Kruglanski, 2003). However, these authors excluded unrestrained eaters from their initial study. Coelho, Polivy, Herman, and Pliner (2008), posited that the relationship between food cue exposure and the importance of one’s dieting goals varied according to an individual’s level of dietary restraint. Results of this study found no differences in the importance of dieting between restrained eaters in a food cue condition versus a non-food cue condition. However, unrestrained eaters in the food cue condition rated a higher importance of dieting than unrestrained eaters in the non-food cue condition (Coelho et al., 2008).

Nevertheless, one’s intentions to diet do not necessarily translate into actual caloric restraint. Several studies have examined whether dietary restraint moderates the relationship between food cue exposure and eating behavior, such that dietary restraint will strengthen this relationship, and have yielded inconsistent findings. Overall, some studies have found that restrained eaters consumed more food after being exposed to a tempting stimulus (e.g., Coelho, Jansen, Roefs, & Nederkoorn, 2009; Coelho, Polivy, Herman, & Pliner, 2009; Fedoroff et al., 2003), while other studies have found that restrained eaters consumed less food after being exposed to a tempting stimulus (Ferriday & Brunstrom, 2008; Nederkoorn & Jansen, 2002; Papies & Hamstra, 2010), and one study found no relationship (Larsen et al., 2012).

There are several important implications from this body of research. Because the strength model of self-regulation (e.g., Baumeister, 2003; Baumeister & Heatherton, 1996) has helped to identify difficulties with controlling one’s behavior, self-regulation may lend explanation to the co-occurrence between disordered eating and alcohol use (Bulik et al., 2004; Gadalla & Piran, 2007). Research examining self-regulation has generally found a non-significant relationship between self-regulation and alcohol consumption (e.g., Carey et al.,
2004; D’Lima et al., 2012; Hustad et al., 2009; Neal & Carey, 2005), while there is a well-supported negative relationship between self-regulation and alcohol problems (e.g., Carey et al., 2004; D’Lima et al., 2012; Hustad et al., 2009; Neal & Carey, 2005). Meanwhile, research that has examined self-regulation in relation to dietary restraint and subsequent overeating has yielded inconsistent findings, with some studies finding a positive relationship between dietary restraint and overeating (e.g., Coelho, Jansen, et al., 2009; Coelho, Polivy, et al., 2009; Fedoroff et al., 2003), while others have found a negative relationship (e.g., Ferriday & Brunstrom, 2008; Nederkoorn & Jansen, 2002; Papies & Hamstra, 2010), or no relationship (Larsen et al., 2012). Taken together, these findings indicate that self-regulation may play a role in identifying the co-occurrence between disordered eating and alcohol use. However, previous research has not examined the prospective relationships between self-regulation, disordered eating, and alcohol consumption simultaneously.

**Methodological issues in the literature**

Several methodological issues exist in the current literature that has examined the overlap between eating and drinking behaviors. First, research has questioned the assessment of dietary restraint and have argued that self-reported dietary restraint is not isomorphic with actual caloric restriction (Goldstein, Katterman, & Lowe, 2013; Stice, Sysko, Roberto, & Allison, 2010). Yet, using a daily diary methodology, Luce and colleagues (2013) found that restrained eaters consumed fewer calories than unrestrained eaters. Therefore, it is imperative to examine whether an individual’s intention to restrict their caloric intake is actually related to caloric restriction during the day. Second, the majority of research examining the relationships between dietary restraint and alcohol use (Krahn et al., 1992; Krahn et al., 2005; & Stewart et al., 2000), dietary restraint and alcohol-related problems (Buchholz et al., 2012; Krahn et al., 2005), and
‘drunkorexia’ has utilized cross-sectional designs (Bryant et al., 2012; Burke et al., 2010; & Giles et al., 2009), which limit the ability to examine temporal relationship between the constructs of interest (Maxwell & Cole, 2007). Although this line of research is promising, more longitudinal research is needed to further understand the co-occurrence between eating and drinking behavior. The one study that has examined the temporal relationships between eating and drinking behavior using an EMA design (Luce et al., 2013) used paper and pencil diaries. Although research has argued that paper and pencil diaries have equivalent psychometric properties as electronic diaries, such as similar levels of participant compliance, internal consistency values, means, and between-person variability (Green, Rafaeli, Bolger, Shrout, & Reis, 2006), other researchers have questioned whether these methods yield similar findings (Broderick & Stone, 2006; Takarangi, Garry, & Loftus, 2006; Tennen, Affleck, Coyne, Larsen, & DeLongis, 2006). Therefore, further replication is needed using electronic diaries.

Additionally, research has not examined potential factors that may lend explanation to the relationships between eating and drinking behaviors. One important mechanism that has been examined in relation to alcohol use and eating behavior is self-regulation (Baumeister, 2003). However, no prior research has examined self-regulation with alcohol use and eating behavior simultaneously. Lastly, although several studies have used EMA to examine the relationships between dietary restraint, alcohol use, and eating after drinking (Buchholz, Luce, et al., 2015; Luce et al., 2013), no previous research has used a daily diary methodology to examine self-regulation as a potential factor involved in these relationships.

**Ecological Momentary Assessment**

In a seminal paper, Stone and Shiffman (1994) proposed the use of EMA, defined as “methods using repeated collection of real-time data on subjects’ behavior and experience in
their natural environments” (Shiffman, Stone, & Hufford, 2008). There are several benefits to using EMA. First, it does not rely on retrospective reports of behavior, thus reducing recall bias and improving the ecological validity of behavioral observations. Second, it allows researchers to examine repeated behavior over time and within different contexts. EMA also allows researchers to examine individual differences in behavior, trends in behavior over time, changes in behavior due to contextual influences, and the temporal antecedents and consequences of behavior (Shiffman et al., 2008). Overall, EMA is a valid and reliable method to obtain information about an individual in their naturalistic environment.

There are several assessment schedules that can be adapted for EMA research (Shiffman et al., 2008). First, researchers can utilize event-based monitoring which examines specific events or episodes, such as drinking episodes. Although useful, event-based monitoring does not reliably assess participant compliance and individuals may not respond to the assessments in an honest manner. Second, a time-based design can be used in which individuals respond to the assessment within a fixed or variable time window. Shiffman and colleagues (2008) propose that this approach is beneficial when examining continuous behavior. Third, researchers can utilize a combination of event-based and time-based assessment schedules. Lastly, researchers can utilize a daily diary approach in which individuals are asked to complete an assessment within a fixed time interval one time per day. Although the latter approach reduces participant burden, retrospective recall bias is likely and researchers are limited in the variability of assessing temporal relationships.

Shiffman and colleagues (2008) proposed several methodological considerations for using EMA in research. First, researchers must be cognizant of the potential for reactivity by participants. Reactivity refers to “the potential for behavior or experience to be affected by the
act of assessing it.” Albeit important, reactivity cannot be directly tested unless there is a change in the behavior of interest. Second, compliance must be examined when using EMA methods, given the threat of potential bias on the observed behavior if participants miss assessments. To ensure high participant compliance, these authors argue for the use of electronic diaries (Shiffman et al., 2008).

**Multilevel Models (MLM)**

Given that EMA allows researchers to examine variability in an individual’s behavior over time (Shiffman et al., 2008), the selection of appropriate statistical techniques becomes important. Since the 1980s, researchers have developed new statistical techniques to model change for use with longitudinal data. These techniques, commonly referred to by the umbrella term multilevel models (MLM), refer to several types of analyses including individual growth models, random coefficient models, mixed models, or hierarchical linear models. There are several benefits in using these approaches for longitudinal data including examining change over time (Singer & Willett, 2003), producing less biased estimates for the examination of individual effects, examining cross-level effects, and dividing the variance and covariance structures between levels. Given that MLM preserves the original nested structure of the data, it has a substantial amount of statistical power (Raudenbush & Bryk, 2002), and thus is preferred over other methods for modeling change.

MLM is utilized when researchers have a nested data structure, or data with multiple levels. The organizational structure of the data can take many forms. Traditionally, MLM was used to examine data structures with “person nested under groups” in which the Level 1 observations (i.e. lower-order observations) referred to “person-level” variables, while Level 2 observations (i.e., higher-order observations) referred to “group-level” variables. Similarly, the
data can be structured as “time nested under person” in which time becomes the lower-order observations (i.e., Level 1), while the individual becoming the higher-order observations (i.e., Level 2) (Raudenbush & Bryk, 2002).

Because this study uses an EMA assessment in which repeated measurements are taken from the same individual over time, this study will utilize the “time nested under person” analysis. Using this type of analysis, the Level 1 observations refer to intra-individual change, or how much a person changes over time. Meanwhile, the Level 2 observations refer to the inter-individual rate of change, or differences in the rate of change between individuals over time according to a specific predictor. These separate models are linked, hence the term MLM (Singer & Willett, 2003). Thus, to examine whether the rate of change is different for each individual over time, researchers use a cross-level interaction, which predicts variability in a slope according to a hypothesized predictor (Raudenbush & Bryk, 2002). In other words, cross-level interactions allow a researcher to determine whether the effect of the Level 1 variable differs from the Level 2 variable (i.e., person) over time (Singer & Willett, 2003). To facilitate the interpretation of the cross-level interaction, Raudenbush and Bryk (2002) recommend researchers center the Level 1 predictor variable. There are several methods of centering available, which should be based on specific research questions. Grand-mean centering is used to examine differences across all observations by taking the overall mean for the outcome and subtracting each observation from this mean. Meanwhile, group-mean centering is used to examine differences across groups (i.e. individuals) by taking the mean for the individual and subtracts each observation from this total. Centering an interaction term does not change the meaning of the interpretation. Zhang, Zyphur, and Preacher (2009) recommend using group-
mean centering while testing mediation in MLM. This statistical approach reduces bias in estimating the effects and reduces the chance of Type I error.

Using longitudinal data, time can be examined in multiple ways, such as a predictor or a discrete event, depending on the research question (Singer & Willett, 2003). Recently, researchers have developed new statistical approaches for use with MLM in order to improve existing techniques for modeling behavior change over time. In particular, a temporal analysis model allows researchers to examine the temporal relationships between the predictor and the outcome in a more nuanced manner. One type of a temporal analysis model is a lagged-effects design, in which “the researcher can examine the effect of a prior day’s event on the current day’s outcome” (Wickham & Knee, 2013). For the purposes of this study, a lagged-effects design was used.

There are several limitations and benefits associated with using a lagged-effects design. One potential limitation to using a lagged effects design is the presence of missing data, which makes it difficult to model change (Wickham & Knee, 2013). However, the benefits of this statistical technique are important, due to the ability to examine a causal relationship between a predictor and an outcome. First, a lagged-effects design allows researchers to model change using relevant variables, as opposed to using time as a predictor to model change (Hawkley, Preacher, & Cacioppo, 2007). Second, researchers are less likely to incorrectly specify a model, produce biased random effects, or overlook the true relationship between the predictor and the outcome using a lagged effects design. Lastly, modeling lagged-effects is important in prospective research, given that the previous day’s behavior may affect the following day’s behavior (i.e., have a carryover effect) (Wickham & Knee, 2013). For instance, if one becomes hungover after a night of heavy drinking on a Friday night, he/she may be less likely to drink on
Saturday night. This statistical approach has been used to examine changes in smoking urges over time (Shiyko, Naab, Shiffman, & Li, 2014), and has applicability for other avenues of research.

**The Present Study**

The purpose of this study was two-fold. First, previous research examining the relationships between dietary restraint and alcohol use (Buchholz et al., 2012; Krahn et al., 1992; Krahn et al., 2005; Stewart et al., 2000), and between dietary restraint and alcohol-related problems (Buchholz et al., 2012; Krahn et al., 2005) has been limited due to the reliance on cross-sectional data. Thus, this study examined the relationships among intended dietary restriction, alcohol use, alcohol-related consequences, and post-drinking food consumption using EMA. Second, given that research has not examined state self-regulation as it relates to these constructs in a woman’s day-to-day life, this study explored state self-regulation as a potential moderator and mediator of these relationships. Because women who engage in dietary restraint spend a substantial amount of time monitoring their caloric intake (Fairburn, 2008), it seems likely that intended dietary restriction uses a substantial amount of state self-regulatory resources. Due to demands placed on a woman’s state self-regulatory capacity, she may be unable to effectively regulate other behaviors, such as consuming alcohol, which may lead to further problems such as alcohol-related consequences and post-drinking food consumption.

**Hypotheses**

**Aim 1.**

The first aim of this study was to examine the construct of intended dietary restriction. Thus, if women report a greater intention to restrict their caloric intake earlier in the day, do they actually restrict their caloric intake later? Although researchers have questioned the validity of
self-report dietary restraint measures by arguing that dietary restraint is not isomorphic with actual caloric restriction (Goldstein et al., 2013; Stice et al., 2010), discrepant findings exist in the literature. Using a ten-day daily diary methodology, Luce and colleagues (2013) found that restrained eaters consumed fewer calories per day than unrestrained eaters. Given these contradictory findings, it is important to examine whether an individual’s intention to restrict their caloric intake was predictive of their subsequent behavior, such as their caloric restriction across the day. First, it was expected that there would be a negative relationship between intention to restrict one’s caloric intake and the number of eating episodes a woman reports consuming. Women who reported a greater intention to restrict their caloric intake would have fewer eating episodes than women with less intent to restrict their caloric intake, consistent with the findings by Luce and colleagues (2013). Second, intention to restrict one’s caloric intake would be related to women’s reported amount of food consumed. Luce and colleagues found restrained eaters consumed fewer calories per day than unrestrained eaters. Given that previous research has not examined this pattern of eating behavior (i.e., eating more, less, or about the same amount of food), there were no specific hypotheses regarding the direction of these effects. Lastly, intention to restrict one’s caloric intake would be positively related to fasting as a compensatory strategy for food consumption. Fasting is defined as going for more than eight waking hours without eating (Fairburn & Beglin, 1994). Thus, women who report a greater intention to restrict their caloric intake would be more likely to engage in fasting as a compensatory strategy.

Aim 2.

The second aim of this study was to examine the construct of drinking intent. Several studies have concluded that intention to drink at baseline is predictive of actual alcohol
consumption at a later time point (e.g., Collins & Carey, 2007; Collins, Witkiewitz, & Larimer, 2011; Elliott & Ainsworth, 2012). However, these studies examined the construct of drinking intent using a pre-post design. To my knowledge, only one study has examined the relationship between drinking intent and alcohol consumption using an EMA methodology (Luce et al., 2013). It was expected that drinking intent would be positively related to the amount of alcohol consumed later in the day, suggesting that women who intend to drink would consume more alcohol than women who do not intend to drink. This aim is important since it will help to advance the existing literature that has examined the intention-behavior gap with alcohol consumption by using a predominantly female sample of moderate drinkers (National Institute on Alcohol Abuse and Alcoholism [NIAAA, 2013].

**Aim 3.**

The third aim of this study was to examine caloric restriction on drinking days. Several authors have concluded that women were more likely to restrict their caloric intake (Giles et al., 2009) and consume fewer eating episodes (Luce et al., 2013) on drinking days as compared to non-drinking days. Thus, it was expected that intention to restrict one’s intake would occur more often on drinking days as compared to non-drinking days.

**Aim 4.**

The fourth aim of this study was to examine the model depicted in Figure 1. Given the positive relationship between dietary restraint and alcohol consumption (Buchholz et al., 2012; Krahn et al., 1992; Krahn et al., 2005; Stewart et al., 2000), it was expected that a greater intention to restrict one’s intake would be associated with consuming more drinks. Second, it was expected that a greater intention to restrict one’s caloric intake would be positively associated with alcohol-related problems, consistent with previous cross-sectional data
*Note: These variables are measured longitudinally in the order depicted above.

**Figure 1**

*Proposed model*
(Buchholz et al., 2012; Krahn et al., 2005). Another goal of this study was to extend previous cross-sectional work by Buchholz and colleagues (2012) by examining whether alcohol consumption mediated the relationship between dietary restraint and alcohol-related problems. Thus, it was expected that women who report a greater intention to restrict their caloric intake would consume more alcohol, which increases their risk of subsequent alcohol-related problems.

Lastly, previous research has been inconsistent regarding the role of alcohol as a disinhibitor of dietary restraint (Buchholz, Luce, et al., 2015; Polivy & Herman, 1976a, 1976b). Therefore, one purpose of this study was to clarify the nature of the relationship between intended dietary restriction, alcohol consumption, and subsequent post-drinking food consumption. It was hypothesized that alcohol consumption would mediate the relationship between intended dietary restriction and post-drinking food consumption. In other words, women who report a greater intention to restrict their caloric intake would consume more alcohol, subsequently increasing the likelihood they would eat after drinking.

In addition, previous research examining the disinhibition of eating behavior has focused on the role of alcohol consumption and negative affect as possible explanatory variables. However, there may be more to this equation. Because prior research has not examined alcohol-related problems in relation to the disinhibition of eating behavior, another purpose of this paper was to extend prior research by examining the association between alcohol-related problems and eating after drinking. Because alcohol consumption is associated with adverse consequences (e.g., Perkins, 2002), it was expected that women who experience problems after drinking may be more likely to engage in eating after drinking than when they do not experience problems after drinking.
Apart from the association between alcohol-related problems and eating after drinking, it also may be that eating after drinking is associated with the use of compensatory behaviors (see Figure 1). Overeating is occasionally followed by the use of compensatory strategies to regain control over one’s eating (Fairburn, 2008). Changes in affect may lend explanation to the use of compensatory strategies following overeating. A recent meta-analysis of EMA studies examined changes in affect as a result of eating. Results indicated a positive effect size between binging and post-binge negative affect, suggesting that women experienced increased negative affect after a binge episode (Haedt-Matt & Keel, 2011). It may be that some women experience increased distress regarding the types and amount of food consumed after drinking, thus increasing the likelihood they will engage in compensatory strategies such as dieting. Thus, eating after drinking may produce a negative feedback cycle between dieting, alcohol consumption, and problems. Several hypotheses were proposed to examine these relationships. First, it was expected that there would be a positive relationship between eating after drinking and increased distress following eating after drinking episodes. On days following episodes of eating after drinking, it was expected that women would experience increased distress due to their post-drinking caloric intake. Second, it was expected that there would be a positive relationship between eating after drinking and subsequent intended dietary restriction. On days following episodes of eating after drinking, women would be likely to engage in intended dietary restriction, as a means of reestablishing control over their eating (Fairburn, 2008). Third, it was expected that distress would mediate the relationship between eating after drinking and subsequent intended dietary restriction. In other words, eating after drinking would produce increased distress, and women would cope with this distress by subsequently engaging in increased dietary restriction.
Aim 5.

Lastly, this study is the first to examine state self-regulation as a potential moderator and mediator of the relationships between intended dietary restriction, alcohol consumption, and alcohol problems, as depicted in Figures 2a and 2b. It was expected that poorer state self-regulation would strengthen the relationships between intended dietary restriction and alcohol consumption; intended dietary restriction and alcohol problems; and between alcohol consumption and alcohol-related problems (see Figure 2b). Because self-regulatory capacity becomes depleted due to constant demands on its resources (Baumeister, 2003; Baumeister & Heatherton, 1996), and dietary restraint is hypothesized to use resources, women who reported a greater intention to engage in dietary restriction would have greater demands on their state self-regulatory resources, thus increasing the likelihood of alcohol consumption. Additionally, because dietary restraint is hypothesized to use resources, and alcohol consumption is associated with less self-regulation (e.g., Carey et al., 2004; D’Lima et al., 2012; Neal & Carey, 2005), it was expected that women who report a greater intention to restrict their caloric intake would have less state self-regulation, leading to increased alcohol-related problems (see Figure 2a). In other words, women who report a greater intention to restrict their caloric intake would experience more alcohol-related problems than women who report less intent to restrict their caloric intake, due to a depletion of their state self-regulatory capacity.
**Figure 2a**

*Proposed mediation: State self-regulation*

*Note: These variables are measured longitudinally in the order depicted above.*
Morning: self-initiated
Random: Behavioral Outcomes

*Note: These variables are measured longitudinally in the order depicted above.

**Figure 2b**

*Proposed moderation*
CHAPTER 2
METHODS

Participants

Participants were 65 undergraduate women at a large Midwestern university, who were recruited from a larger pool of 1875 undergraduate women through an online mass testing survey over the course of four semesters. Participants completed the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985), and were eligible for this study if they were female, at least 18 years old, and were classified as moderate drinkers according to the criteria proposed by the National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2013). Thus, women were considered moderate drinkers if they consumed at least three drinks per day or at least seven drinks per week. Of the 1875 women screened, 685 (36.5%) met the eligibility criteria. Of these 685 women who met the eligibility criteria, 65 (9.5%) consented to participate in this study.

Several analyses were conducted to examine whether there were demographic differences between women who were eligible for this study and participated (n = 65) and women who were eligible for this study and did not participate (n = 620) in age, marital status, and ethnicity. First, an independent samples t-test was conducted to examine differences in age between women who were eligible and participated in this study, and women who were eligible and did not participate. Results indicated a significant difference in age, (t (683) = -2.128, p = .034, d = .28), suggesting that women who participated in this study were older (M_{age} = 19.9, SD = 2.27) than women who did not participate in this study (M_{age} = 19.3, SD = 1.97, respectively). This difference had a small effect size (Cohen, 1992).
Next, separate chi-square analyses were conducted to determine whether there were significant differences in marital status and ethnicity.\footnote{Data for this study were obtained from a mass testing procedure over the course of four semesters. However, information pertaining to ethnicity were not collected during mass testing for two semesters. Thus, this analysis includes observations in which the ethnicity data were available (i.e., \(N = 357\)).} There were no significant differences in marital status between groups (\(\chi^2 (3) = 2.451, p = .48\)), or ethnicity (\(\chi^2 (3) = 5.614, p = .132\)).

One participant (1.5%) was removed prior to data analysis, due to missing data on the palm pilot portion of this study. Five individuals (7.8%) were removed prior to conducting analyses due to poor compliance with the palm pilot portion of the study (i.e., responding to less than 20% of the total prompts; Ridolfi, Myers, Crowther, & Ciesla, 2011). This resulted in a final sample of fifty-nine women (\(N = 59\)). Participants were, on average 20.0 years old (\(SD = 2.35\)) with a body mass index (BMI) of 23.5 (\(SD = 4.87\)). The majority of these women were in their first year of college (\(n = 24, 40.7\%\)), 11.9% were sophomores, 27.1% were juniors, and 20.3% were seniors. The sample was predominantly Caucasian (\(n = 53, 89.8\%\)), followed by African American (\(n = 3, 5.1\%\)), Asian (\(n = 1, 1.7\%\)), and Pacific Islander (\(n = 1, 1.7\%\)). One participant did not indicate her ethnicity (1.7%). Participants’ heights and weights were measured in the laboratory to calculate their BMIs using the following formula by the Centers of Disease Control and Prevention (CDC, 2009): BMI= [(weight (lb)/(height (in\(^2\))) X 703. Using guidelines from the CDC (2009), four women (6.8%) had a BMI in the underweight category (i.e., BMI < 18.5), 37 women (62.7%) had a BMI in the normal weight category, 13 women (22.0%) had a BMI in the overweight category, and five women (8.5%) had a BMI in the obese category. Table 1 presents the demographic information for this study.

**Procedure**

This research was approved by the University’s Institutional Review Board. Following informed consent (see Appendix A), participants’ height and weight were measured by a female

<table>
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<th>Ethnicity</th>
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</tr>
<tr>
<td>BMI</td>
<td>59</td>
<td>23.5</td>
<td>4.87</td>
</tr>
</tbody>
</table>

*Note. N = 59. BMI = body mass index.*
research assistant in order to calculate each individual’s BMI. Participants were then asked to complete a battery of questionnaires individually on a computer, which were not a focus of this study. After completing these questionnaires, the research assistant explained the purpose of the palm pilot portion of the study and reviewed the items the individuals would be asked to complete over the next ten days. Participants were asked to complete a morning assessment before leaving the laboratory and a follow-up appointment was scheduled approximately ten days later.

For the purposes of this study, event-based (i.e., morning assessment) and time-based (i.e., random assessments) were utilized (Shiffman et al., 2008). Participants were instructed to complete the morning assessment on the palm pilot once each day upon waking between the hours of 9 a.m. to 12 p.m. Participants were also instructed to complete a diary entry on the palm pilot whenever the alarm sounded. The alarm sounded at five randomly selected times each day between the hours of 12 p.m. to 1 a.m. over the course of 10 days. The randomly selected times for the questionnaires differed for each of the 10 days and were constrained to be at least 130 minutes apart. To increase participant compliance, the alarm sounded every 60 seconds for 5 minutes for each of the random questionnaires. If participants did not respond to the alarm within 5 minutes, the palm pilot reset and the participant missed an opportunity to complete that particular questionnaire. To reduce the occurrence of missed questionnaires, participants had two options. First, the palm pilot included a do not disturb function. Thus, participants could set periods of time ranging from 5 to 60 minutes during which the palm pilot would not sound. Any random prompts that were scheduled to occur within this time period were rescheduled to occur after the do not disturb period ended. Second, participants had the option to put the palm pilot on silent mode. Thus, participants could set the palm pilot to vibrate
during times when they were unable to complete a random prompt. Lastly, participants were instructed not to complete random prompts in situations in which it might be dangerous or inappropriate to do so (i.e., while driving or while in class).

During the follow-up session, a female research assistant measured each participant’s height and weight in order to re-calculate their BMI. The research assistant collected the palm pilot and asked the participant to complete a second battery of questionnaires individually, which were not a focus of this study. In exchange for their participation, participants were given nine research credits toward their research participation requirements in their psychology courses. Participants also received a nominal payment in the form of a gift card at a local department store (i.e., Walmart or Target) according to their level of compliance. Thus, participants were given $8 if they completed 0 to 25% of the palm items; $10 if they completed 25 to 50% of the palm items; and $12 if they completed 50 to 100% of the palm items.

Apparatus

All participants were given a pre-programmed Palm Centro 690 to complete the following diary measures. The palm pilots were pre-programmed using the Purdue Momentary Assessment Tool software (PMAT; Weiss, Beal, Lucy, & MacDermid, 2004).

Measures

Baseline Measures.

**Demographic Information (see Appendix B for items).**

Questions assessed the participant’s age, year in school, and ethnicity.

Diary Measures (see Appendices C & D for items).

**Morning Assessment (see Appendix C).**

*Intended dietary restriction.*
Participants completed a single item to assess their intended dietary restriction later in the day. Participants were asked “how likely are you to restrict your caloric intake today?” using a 5-point scale from “1 = not at all” to “5 = extremely.”

Negative affect.

Negative affect was assessed during the morning assessment using the Negative Affect subscale from the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). For each morning assessment, women were provided with the following statement: “How (name of each adjective) are you feeling right now?” (see Appendix C). Women provided ratings for each adjective using a 5-point Likert scale from “1 = very slightly or not at all” to “5 = extremely,” with higher scores reflecting greater negative affect. The PANAS has excellent internal consistency ($r = 0.85$ for NA) (Crawford & Henry, 2004) and weak test-retest reliability for the moment ($r = 0.45$ for NA) (Watson et al., 1988).

Drinking intent.

Participants completed a single item to assess their intention to drink later in the day using a 3-point scale from “0 = plan to not drink,” “1 = plan to drink,” and “2 = unsure, I’ll see what happens.” Drinking intent was recoded into a dichotomous variable. Thus, plan to drink and unsure were recoded as “1,” while plan to not drink was coded as a “0.”

State self-regulation.

Participants were asked to complete two self-report items to assess their state self-regulation. First, participants were asked “to what extent are you forcing yourself to DO

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2 Drinking intent was recoded into a dichotomous variable using a conceptual and an empirical rationale. It was anticipated that someone’s intention to drink may change throughout the day, with “unsure” suggesting the possibility of later drinking. Thus, it was decided to recode drinking intent into a dichotomous variable. Preliminary analyses, not reported here, compared the relationships between drinking intention, no drinking intention, and unsure to drinking intent later in the day. Using no intention to drink versus unsure, there was a significant positive relationship suggesting that unsure was associated with 20.12 times greater likelihood of drinking later that day. Using intention to drink versus unsure, there was a significant negative relationship, suggesting that unsure was associated with a .08 times decreased likelihood of drinking later that day.
something that you did NOT want to do today” on a 5-point scale from “1 = not at all” to “5 = extremely.” Second, participants were asked “to what extent are you forcing yourself to NOT do something that you want to do today” on a 5-point scale from “1 = not at all” to “5 = extremely.” A correlation was conducted between the two individual state self-regulation items ($r = .45, p < .0001$). Because these items had a moderate correlation, a composite variable was created by adding these two items together. For all subsequent analyses, the total score for state-self-regulation was used, with higher scores reflecting greater demands on self-regulatory capacity, hence poorer state self-regulation.

*Post-drinking eating.*

Participants were asked to complete a single self-report item to determine their eating habits after drinking the night before. Participants were asked whether or not they ate after drinking last night.

**Random prompts (see Appendix D).**

*Negative affect*

Negative affect was assessed during the random portion of the study using the Negative Affect subscale from the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). For each random prompt, women were provided with the following statement: “How (name of each adjective) are you feeling right now?” (see Appendix D). Women provided ratings for each adjective using a 5-point Likert scale from “1 = very slightly or not at all” to “5 = extremely,” with higher scores reflecting greater negative affect. The PANAS has excellent internal consistency ($r = 0.85$ for NA) (Crawford & Henry, 2004) and weak test-retest reliability for the moment ($r = 0.45$ for NA) (Watson et al., 1988). Although my initial proposal included examining distress following an eating episode, these data were not included in my dissertation.
analyses, due to a limited number of observations in which participants rated eating after drinking ($n = 24$).

*Alcohol Consumption.*

Alcohol consumption was assessed using a single item. Individuals rated the number of drinks they consumed since the last assessment on a 12-point scale from “0 = 0 drinks” to “12 = 11 or more drinks.”

*Alcohol Problems.*

Participants were instructed to rate whether any of the following alcohol-related consequences occurred since the last assessment. Participants were informed that they could indicate one or more of the following problems: neglected responsibilities, spent too much money, got into a verbal (not physical) fight or argument, got into a physical fight, family or friends concerned about their behavior, relationship harmed due to their behavior, felt hung over, got hurt or injured, did something they regret, had unplanned sexual activity, or none of the above. A total score was used by summing together all of the items for alcohol problems.

*Eating-related variables.*

Individuals were asked several single-item questions regarding their eating habits. First, individuals were asked whether or not they ate since the last assessment. Next, individuals were asked to rate the type of eating episode (i.e., snack, breakfast, lunch, or dinner). Third, individuals were asked to rate the quantity of the food consumed. Thus, they could only provide one response to eating more (scored as 2), eating less (0), or eating the same amount of food (1) since the last assessment. Thus, higher scores on eating quantity represent consuming larger quantities of food.

*Fasting.*
To determine the use of compensatory strategies after eating and drinking, individuals were asked to rate whether or not they used fasting to compensate for the calories they consumed.
CHAPTER 3

RESULTS

Testing MLM Assumptions

Prior to conducting analyses, the following assumptions for MLM were tested (Raudenbush & Bryk, 2002).

Normally distributed error terms.

First, MLM assumes that the Level 1 and Level 2 error terms are normally distributed and homoscedastic which was tested through visual inspection of the residual versus fitted plot for the Level 1 error terms (Singer & Willett, 2003). According to the residual versus fitted plot for the Level 1 error terms, the outcomes appeared to be normally distributed, except for drinking quantity. Therefore, the fixed effects with robust standard error terms were reported for drinking quantity only. Second, MLM assumes the distribution of the Level 1 variable is linear, which was examined by plotting the distribution of the Level 1 variable for each separate analysis (Singer & Willett, 2003). Results indicated the distribution for each Level 1 variable was linear.

A conceptual assumption for MLM is that the model is properly specified. Lastly, the estimation procedure used for each analysis was the full maximum likelihood procedure, which is less biased than the restricted maximum likelihood solution (Raudenbush & Bryk, 2002).

Participant compliance.

Second, participant compliance was evaluated prior to conducting analyses. Individuals could respond to a total of 60 prompts (10 morning and 50 random) throughout the duration of the study. The initial sample was 64 participants. Descriptive analyses indicated that
participants responded to 57.1% \((n = 2014)\) of the total number of prompts \((N = 3527)\).

Participants completed 98.0% \((n = 502)\) of the self-initiated morning assessments \((T = 512)\) and 50.2% \((n = 1512)\) of the random prompts \((T = 3012)\). Individuals whose compliance rate fell below 20% of total responses (i.e., less than 12 total observations), were removed prior to running analyses (Ridolfi et al., 2011). Five individuals (7.8%) met these exclusionary criteria and were removed from the data set, resulting in a final sample of 59 individuals.

Using the final sample \((N = 59)\), participants responded to 60.2% \((n = 1952)\) of the total number of prompts \((N = 3243)\). Of the 479 self-initiated morning assessments, participants provided complete data for the last item 99.0% \((n = 474)\) of the time. Of the 2764 random prompts, participants provided complete data for the last item of the survey 53.5% of the time. Participants completed 99.0% \((n = 474)\) of the self-initiated morning assessments \((T = 479)\) and 53.5% \((n = 1478)\) of the random prompts \((T = 2764)\). Although participants could respond to a total of 590 morning assessments, some participants did not provide data for the entire duration of the study (i.e., ten days). One explanation for this finding was a palm pilot malfunction. In particular, some participants were unable to retrieve the surveys for up to two days throughout the duration of the study. After careful inspection of the data, it was decided to include these individuals in the final sample.

**Missing data.**

One benefit of using MLM is the ability to handle unbalanced designs in which the observations are not equally spaced between individuals (Raudenbush & Bryk, 2002). Since attrition is common in longitudinal research, MLM is a preferred statistical approach. MLM can handle missing data at the lower-level or Level-1 observations, as long as the data are assumed to be missing at random. However, MLM cannot handle missing observations at the higher-level or
Level-2 observations. First, the data were examined for missingness at Level 1 by running frequency distributions for the constructs of interest. Of the 479 morning assessments that participants could complete, there were 1.0% missing observations (\(n = 5\)). For the completed morning assessments (\(n = 474\)), there was one missing observation for intended dietary restriction (0.2%), and one missing observation for eating after drinking (0.2%). Meanwhile, there were no missing observations for intention to drink in the morning or for negative affect.

Of the 2764 random prompts that participants could complete, there were 46.5% missing observations (\(n = 1286\)). For the completed random assessments (\(n =1478\)), there were 3 (0.2%) missing observations for alcohol problems, 687 (46.5%) missing values for eating quantity, and 688 (46.5%) missing values for fasting. Meanwhile, there were no missing observations for drinking intent, drinking quantity, or negative affect. Of the 1478 completed random prompts, participants endorsed not drinking 93.2% of the time (\(n = 1378\)). Meanwhile, participants endorsed consuming at least one drink 6.8% (\(n = 100\)) of the time.

There are several possible explanations for missing data during the random portion of this study. First, missing data may have been present for some of the random prompts since they were scheduled to occur between specific intervals of time. For example, because the random prompts were scheduled to occur until 2 a.m., some individuals may have missed random prompts later in the evening if they went to bed prior to this time. Second, it was anticipated that individuals may not consistently respond to each random prompt. In other words, individuals may not eat or drink at every random prompt, and missing data would be expected to occur. Next, the data were explored for patterns of missingness. For all of the variables of interest, the data appear to be missing at random. Because all of the analyses were conducted at Level 1, missingness was not explored at Level 2.
Power Analysis

In a seminal paper, Cohen (1992) asserts that a vast majority of behavioral scientists ignore the use of a power analysis prior to designing a study or running statistical analyses. Power refers to the likelihood that a researcher will obtain a statistically significant result. Since MLM utilizes nested-data structures, power must be determined at two levels, the number of time points per person at Level 1 ($T$), and the number of people at Level 2 ($n$). Although MLM techniques yield substantial statistical power since it preserves the original structure of the data (Raudenbush & Bryk, 2002), several authors have proposed guidelines to detect statistical significance. Snijders and Bosker (1999) consider samples of 30 or more to be “large.” Given that the number of participants in this study exceeded this limit ($n = 59$) and provided multiple data points over the course of ten days ($T = 60$), it can be assumed that this study had substantial power to detect statistical significance.

Analysis Overview

After conducting the initial MLM analyses, the following steps were completed to obtain a more refined analysis of the data. In order to create meaningful variables that represented activity for a day, the random portion of the data was aggregated by day for each individual. This allowed me to construct my data to analyze my proposed models in a meaningful way. Thus, the initial value for the day was used for the following morning assessments: eating after drinking, drinking intent, and total state self-regulation. In addition, a sum score was created for distress which was measured during the morning assessment. Meanwhile, the average value for the day was created for the following random prompt: estimated eating quantity (i.e., more, less, or about the same). On the other hand, a sum score was created for the following random prompts: drinking quantity, alcohol problems, and number of eating episodes (see Morning
Assessment and Random Prompts questionnaire in Appendices C and D, respectively, for details on the constructs used in the palm pilot portion of the study). Lastly, the continuous measure for intended dietary restriction was entered as a group-centered predictor for all subsequent analyses.

Aim 1

The first aim examined whether women who report a greater intention to restrict their caloric intake in the morning actually restrict their caloric intake that day. Of the 474 completed morning assessments, there were 194 episodes (40.9%) in which participants reported intending to restrict their caloric intake that day. Participants rated their intention to restrict their caloric intake on a 5-point Likert scale from one to five, with higher scores indicating a greater intention to engage in caloric restriction. On average, a woman’s intention to restrict her caloric intake was 1.8 ($SD = 1.20$). As noted above, a new variable was created to determine the number of eating episodes a woman had that day by summing the total number of times she endorsed eating during the random portion of the study (range= 0-5 prompts). Of the 1478 completed observations, participants stated that they did not eat 46.5% ($n = 688$) of the time. Of the 790 observations in which participants reported eating, they ate one meal/snack 24.1% ($n = 191$) of the time, ate two meals/snacks 41.0% of the time ($n = 324$), ate three meals/snacks 24.7% of the time ($n = 195$), ate four meals/snacks 7.6% ($n = 60$) of the time, and ate five meals/snacks 2.5% ($n = 20$) of the time. Table 2 presents information regarding the types of eating episodes participants endorsed.

**Intended dietary restriction and the number of eating episodes.**

The first MLM analysis examined if women who intend to restrict their caloric intake earlier in the day have fewer eating episodes later in the day. The following Level 1 model was
Table 2

Types of Eating Episodes

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snack</td>
<td>190</td>
<td>24.1</td>
</tr>
<tr>
<td>Breakfast</td>
<td>70</td>
<td>8.9</td>
</tr>
<tr>
<td>Lunch</td>
<td>244</td>
<td>30.9</td>
</tr>
<tr>
<td>Dinner</td>
<td>286</td>
<td>36.2</td>
</tr>
</tbody>
</table>

*Note. For the random prompts, participants endorsed 790 episodes (53.4%) in which they reported eating since the previous prompt.*
used to test this hypothesis: \( \gamma(\text{Eating Episodes}) = \pi_{00} + \pi_{10}(\text{Intended Dietary Restriction}) + r_0 + e. \) Results indicated a non-significant relationship between intended dietary restriction and the number of eating episodes, \( (\pi_{10} = .607, SE = .389, t (514) = 1.559, p = .120). \)

To obtain a more refined analysis of the relationship between intended dietary restraint and eating quantity, a supplemental analysis was conducted. The dependent variable was coded such that higher scores indicate consuming greater amounts of food, while a lower score indicates eating less. The following Level 1 model was used to test this hypothesis:
\[ \gamma(\text{EatingQuantity}) = \pi_{00} + \pi_{10}(\text{Intended Dietary Restriction}) + r_0 + e. \] Results indicated a non-significant relationship between intended dietary restriction and eating quantity, \( (\pi_{10} = .008, SE = .042, t (514) = .204, p = .839). \)

**Intended dietary restriction and fasting.**

Lastly, the relationship between intended dietary restriction and fasting was examined. Of the 790 episodes in which women reported eating, they reported fasting to remove excess calories from eating 3.0% of the time \((n = 24).\) Because the outcome variable was dichotomous, a Bernoulli model was used. The following model was tested: \( \gamma(\text{Fasting}) = \pi_{00} + \pi_{10}(\text{Intended Dietary Restriction}) + r_0 + e. \) Results indicated a non-significant relationship intended dietary restriction and fasting, \( (\pi_{10} = -.010, SE = .006, t (514) = -1.698, p = .09). \)

**Aim 2**

To test hypothesis two, that women who report an intention to drink actually consume alcohol, the following analyses were conducted. Of the 474 morning assessments participants completed, women rated an intention to drink 12.1% of the time \((n = 58),\) denied an intention to drink 66.0% of the time \((n = 316),\) and rated “unsure, I’ll see what happens” 20.9% of the time \((n = 100).\)
Amount of alcohol consumed.

Information regarding the amount of alcohol women reported consuming is reported in Table 3, while Table 4 presents the types of drinks women reported consuming. The following MLM was used: \( \gamma(\text{Number of drinks}) = \pi_{00} + \pi_{10}(\text{DrinkingIntent Morning}) + r_0 + e \). Because the outcome variable was skewed, the fixed effects with robust standard errors were reported. Results indicated that intending to drink in the morning was associated with greater alcohol consumption later that day, \( \pi_{10} = .981, SE = .272, t (514) = 3.608, p < .0001 \).

Aim 3

The third aim of this study was to examine caloric restriction on drinking days. It was hypothesized that intention to restrict one’s caloric intake would occur more often on drinking days as compared to non-drinking days. First, a new variable was created for drinking days. If participants endorsed consuming at least one alcoholic drink during the random portion of the data, this variable was coded as a “1.” Meanwhile, if they endorsed consuming zero drinks, this was coded as a “0.” Of the 1478 completed random prompts, participants endorsed not drinking 93.2% of the time (\( n =1378 \)). Meanwhile, participants endorsed consuming at least one drink 6.8% (\( n = 100 \)) of the time.

To test this hypothesis, the following MLM was used: \( \gamma(\text{DrinkingDay}) = \pi_{00} + \pi_{10}(\text{Intended Dietary Restriction}) + r_0 + e \). Since the outcome variable was dichotomous, a Bernoulli model was used. Results indicated a non-significant relationship between intended dietary restriction and whether or not women drank that day, \( \pi_{10} = .156, SE = .343, t (514) = .455, p = .649 \). Descriptive analyses, presented in Table 5, examined the most frequent reasons women reported for restricting their caloric intake on days they intended to drink or were unsure of their drinking habits that day. The most frequently endorsed reasons for restricting one’s
Table 3

*Number of drinks consumed*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 drinks</td>
<td>1378</td>
<td>93.2</td>
</tr>
<tr>
<td>1 drink</td>
<td>33</td>
<td>2.2</td>
</tr>
<tr>
<td>2 drinks</td>
<td>25</td>
<td>1.7</td>
</tr>
<tr>
<td>3 drinks</td>
<td>10</td>
<td>.7</td>
</tr>
<tr>
<td>4 drinks</td>
<td>9</td>
<td>.6</td>
</tr>
<tr>
<td>5 drinks</td>
<td>6</td>
<td>.4</td>
</tr>
<tr>
<td>6 drinks</td>
<td>4</td>
<td>.3</td>
</tr>
<tr>
<td>7 drinks</td>
<td>1</td>
<td>.1</td>
</tr>
<tr>
<td>8 drinks</td>
<td>3</td>
<td>.2</td>
</tr>
<tr>
<td>9 drinks</td>
<td>3</td>
<td>.2</td>
</tr>
<tr>
<td>10 drinks</td>
<td>2</td>
<td>.1</td>
</tr>
<tr>
<td>11 or more drinks</td>
<td>4</td>
<td>.3</td>
</tr>
</tbody>
</table>

*Note.* There were 1478 completed random prompts in which participants provided data regarding their alcohol consumption.
### Table 4

*Types of drinks consumed*

<table>
<thead>
<tr>
<th>Drink Type</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark Beer</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td>Light Beer</td>
<td>27</td>
<td>27.3</td>
</tr>
<tr>
<td>Wine</td>
<td>23</td>
<td>23.2</td>
</tr>
<tr>
<td>Mixed Drink</td>
<td>32</td>
<td>32.3</td>
</tr>
<tr>
<td>Caffeinated Cocktail</td>
<td>5</td>
<td>5.1</td>
</tr>
<tr>
<td>Malt Beer</td>
<td>8</td>
<td>8.1</td>
</tr>
</tbody>
</table>

*Note.* For the completed random prompts in which participants reported consuming alcohol, there were 98 episodes (98.0%) in which they reported the specific types of drinks consumed while drinking alcohol. Participants were instructed to endorse the drink they consumed the most of while drinking.
Table 5

Reasons for caloric restriction prior to drinking alcohol

<table>
<thead>
<tr>
<th>Reason</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern about weight/appearance</td>
<td>43</td>
<td>27.0</td>
</tr>
<tr>
<td>To get drunk faster</td>
<td>9</td>
<td>5.7</td>
</tr>
<tr>
<td>To avoid feeling heavy/full</td>
<td>32</td>
<td>20.1</td>
</tr>
<tr>
<td>To avoid getting sick</td>
<td>8</td>
<td>5.0</td>
</tr>
<tr>
<td>To save money</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>None of the above</td>
<td>99</td>
<td>62.3</td>
</tr>
</tbody>
</table>

*Note. N = 159 morning episodes. Participants could endorse more than one item, or “none of the above,” resulting in a total N = 201.*
caloric intake were concerns about appearance (27.0%), to avoid feeling heavy or full (20.1%), and to save money (6.3%).

**Aim 4: Figure 1**

To test the model depicted in Figure 1, several sets of analyses were conducted. First, alcohol consumption was examined as a potential mediator of the relationship between intended dietary restriction and alcohol problems. Second, alcohol consumption was examined as a predictor of the relationship between post-drinking eating and subsequent intended dietary restriction. Third, distress was examined as a potential mediator in the relationship between post-drinking eating and subsequent intention to restrict one’s caloric intake. Lastly, the association between post-drinking eating and alcohol problems was examined.

**Mediational analyses.**

Baron and Kenny’s (1986) guidelines were used to test for mediation in MLM. First, the path from the independent variable to the dependent variable was tested. Second, the path from the independent variable to the mediator was tested. Third, the path from the mediator to the dependent variable was tested. Lastly, the relationship between the independent variable and the dependent variable was tested, after accounting for the effects of the mediator variable. This technique has been supported for testing mediation in MLM in which the predictor, mediator, and outcome are all located at the Level-1 unit. Several authors have argued that mediation can still be tested even if these paths are non-significant (Bauer, Preacher, & Gil, 2006; Zhang et al., 2009), in contrast to recommendations outlined by Baron and Kenny (1986).

**Intended dietary restriction, drinking quantity, and alcohol-related problems.**

Drinking quantity was examined as a potential mediator of the relationship between intended dietary restriction and alcohol-related problems. To test path a between the
independent variable and the dependent variable, the following model was used: \( \gamma (\text{Drinking Quantity}) = \pi_{00} + \pi_{10} (\text{Intended dietary restriction}) + r_{1j} \). Results indicated a positive relationship between intended dietary restriction and subsequent drinking quantity, \( (\pi_{10} = .411, SE = .153, t (514) = 2.678, p = .008) \), suggesting that a higher intention to restrict one’s caloric intake is associated with greater alcohol consumption.

To test path b between the mediator and dependent variable, the following model was used: \( \gamma (\text{Alcohol problems}) = \pi_{00} + \pi_{10} (\text{Drinking Quantity}) + r_{1j} \). Results indicated a positive relationship between drinking quantity and alcohol-related problems, \( (\pi_{10} = .261, SE = .070, t (514) = 3.716, p < .0001) \), suggesting that higher amounts of alcohol consumption were associated with greater alcohol problems.

To test path c between the independent variable and the dependent variable, the following model was used: \( \gamma (\text{Alcohol problems}) = \pi_{00} + \pi_{10} (\text{Intended dietary restriction}) + r_{1j} \). Results indicated a positive relationship between intended dietary restriction and the total number of alcohol-related problems experienced, \( (\pi_{10} = .372, SE = .093, t (514) = 3.981, p < .0001) \).

To test path c’ between the independent variable and the dependent variable after including the effects of the mediator, the following model was used \( \gamma (\text{Alcohol problems}) = \pi_{00} + \pi_{10} (\text{Intended dietary restriction}) + \pi_{20} (\text{Drinking Quantity}) + r_{1j} \). The relationship between drinking quantity and alcohol problems remained significant \( (\pi_{10} = .246, SE = .029, t (513) = 8.429, p < .0001) \). After including the effects of the mediator, the relationship between intended dietary restriction and alcohol problems remained significant, \( (\pi_{10} = .271, SE = .086, t (513) = 3.137, p = .002) \). Results of the Sobel test (Preacher & Leonardelli, 2015) were significant, \( Z = 2.04, SE = .054, p = .004 \), indicating that drinking quantity partially mediated the relationship between intended dietary restriction and alcohol-related problems.
**Intended dietary restriction, post-drinking eating, and drinking quantity**

To assess eating after drinking, the data women provided during the subsequent morning assessment were used for their post-drinking eating. This item was selected for several reasons. First, since women were instructed to self-initiate the morning assessment, the potential for selection bias is reduced. Second, women may be less likely to be intoxicated while completing the morning assessment as compared to the random prompts.

To test whether post-drinking eating mediates the relationship between drinking quantity and subsequent intended dietary restriction, the following analyses were conducted. Although post-drinking eating reflects eating the night before, it was measured in the morning. Thus, drinking quantity from the previous day was entered as a lagged effect to examine the temporal nature of the data. Next, drinking quantity was entered as a group-centered predictor to examine the within-individual variability. Because the outcome variable is dichotomous, a Bernoulli model was used. To test path a, the following model was used: \( \gamma (\text{Post-drinking eating}) = \pi_{00} + \pi_{10} (\text{LagDrinking Quantity}) + r_{1j} \). Results indicated a positive relationship between drinking quantity and post-drinking eating, \( (\pi_{10} = .338, SE = .075, t (514) = 4.487, p < .0001) \), suggesting that consuming greater quantities of alcohol was associated with a 1.4 times (OR = 1.402) greater likelihood of eating after drinking.

To test path b, the following model was used: \( \gamma (\text{Intended dietary restriction}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + r_{1j} \). Results indicated a positive relationship between post-drinking eating and subsequent intended dietary restriction, \( (\pi_{10} = .300, SE = .108, t (514) = 2.790, p = .005) \), suggesting that women who report eating after drinking were more likely to report a higher intention to restrict her caloric intake than women who did not report eating after drinking.
To test path c, the following model was used: $\gamma$ (Intended dietary restriction) = $\pi_{00} + \pi_{10}$ (LagDrinking Quantity) + $r_{ij}$. Drinking quantity was entered as a group-centered predictor. Results indicated a non-significant relationship between drinking quantity and subsequent intended dietary restriction, ($\pi_{10} = -.008, SE = .018, t (514) = -.450, p = .653$).

To test path c’, the following model was used $\gamma$ (Intended dietary restriction) = $\pi_{00} + \pi_{10}$ (LagDrinking Quantity) + $\pi_{20}$ (Post-drinking eating) + $r_{ij}$. Drinking quantity was entered as a group-centered predictor. There was a positive relationship between post-drinking eating and subsequent intended dietary restriction, ($\pi_{20} = .411, SE = .124, t (513) = 3.330, p = .001$). Thus, women who reported eating after drinking reported a higher intention to restrict their caloric intake than women who did not report eating after drinking. After including the effects of the mediator, the relationship between drinking quantity and subsequent intended dietary restriction remained non-significant, ($\pi_{10} = -.030, SE = .019, t (513) = -1.558, p = .120$). Results of the Sobel test (Preacher & Leonardelli, 2015) were non-significant, $Z = -1.490, SE = .007, p = .136$, indicating that post-drinking eating did not mediate the relationship between drinking quantity and subsequent intended dietary restriction.

*Alcohol-related problems and post-drinking eating.*

Lastly, to examine the association between alcohol-related problems and post-drinking eating, the following analysis was conducted. Although post-drinking eating was assessed in the morning, it refers to eating the night before. Meanwhile, alcohol-related problems represented a sum of items endorsed during the random portion of the study the day before. Thus, alcohol-related problems was entered as a lagged effect in order to determine its association with post-drinking eating. The following model was used: $\gamma$ (Post-drinking eating) = $\pi_{00} + \pi_{10}$ (LagAlcohol-related problems) + $r_{ij}$. Because post-drinking eating is a dichotomous variable, a
Bernoulli model was used. Results indicated a positive relationship between alcohol-related problems and post-drinking eating, \((\pi_{10} = .291, SE = .111, t (514) = 2.538, p = .011)\), suggesting that experiencing greater problems after drinking was associated with a 1.3 times greater likelihood of subsequent eating after drinking (OR = 1.324).

**Is post-drinking eating predictive of subsequent distress after eating?**

To examine whether post-drinking eating is predictive of subsequent distress after eating, several steps were taken. First, given the low prevalence of eating episodes after drinking \((n = 24)\), there is not sufficient power to perform the proposed analysis. Thus, this analysis was tailored by using the distress variable measured in the morning assessment. The following model was used: \(\gamma \text{ (Distress)} = \pi_{00} + \pi_{10} \text{ (Post-drinking eating)} + r_{1j}\). Although post-drinking eating was measured during the morning assessment, it refers to eating the night before. Results indicated a non-significant relationship between post-drinking eating and subsequent distress, \((\pi_{10} = .578, SE = .606, t (514) = .953, p = .341)\).

**Is post-drinking eating predictive of subsequent intended dietary restriction?**

To examine whether eating after drinking is positively related to subsequent intended dietary restriction, the following analysis was used: \(\gamma \text{ (Intended dietary restriction)} = \pi_{00} + \pi_{10} \text{ (Eating after drinking)} + r_{1j}\). Intended dietary restriction and post-drinking eating were both measured during the morning assessment. Results indicated a positive relationship between post-drinking eating and subsequent intended dietary restriction \((\pi_{10} = .300, SE = .108, t (514) = 2.790, p = .005)\). On days women ate after drinking, they were more likely to report engaging in subsequent intended dietary restriction than on days they did not report eating after drinking.
**Post-drinking eating, distress, and subsequent intended dietary restriction.**

To test whether distress mediates the relationship between post-drinking eating and subsequent intended dietary restriction, the following analyses were conducted. Intended dietary restriction and post-drinking eating were assessed during the morning assessment. Meanwhile, the morning variable for distress was used given the limited number of observations in which women reported eating after drinking ($n = 24$). To test path a, the following model was used: $\gamma (\text{Distress}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + r_{1j}$. Results indicated a non-significant relationship between post-drinking eating caloric intake and subsequent distress, ($\pi_{10} = .578$, $SE = .606$, $t (514) = .953$, $p = .341$).

To test path b, the following model was used: $\gamma (\text{Intended dietary restriction}) = \pi_{00} + \pi_{10} (\text{Distress}) + r_{1j}$. Distress was entered as a group-centered variable to examine the within-individual variability. Results indicated a negative relationship between distress and subsequent intended dietary restriction, ($\pi_{10} = -.033$, $SE = .009$, $t (514) = -3.829$, $p < .0001$), suggesting that greater negative affect was associated with less intended dietary restriction.

To test path c, the following model was used: $\gamma (\text{Intended Dietary Restraint}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + r_{1j}$. Results indicated a positive relationship between post-drinking eating and subsequent intended dietary restraint, ($\pi_{10} = .300$, $SE = .108$, $t (514) = 2.790$, $p = .005$). When women reported eating after drinking, they reported greater intended dietary restraint the next morning.

To test path c', the following model was used $\gamma (\text{Intended Dietary Restriction}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + \pi_{20} (\text{Distress}) + r_{1j}$. Distress was entered as a group-centered predictor. There was a negative relationship between distress and subsequent intended dietary restriction, ($\pi_{20} = -.034$, $SE = .008$, $t (513) = -3.956$, $p < .0001$), suggesting that higher levels of negative
affect were associated with less intended dietary restriction. After including the effects of the mediator, the relationship between post-drinking eating and subsequent intended dietary restriction remained significant, ($\pi_{10} = .313$, $SE = .106$, $t (513) = 2.964$, $p = .003$). Results of the Sobel test (Preacher & Leonardelli, 2015) were non-significant, $Z = -.923$, $SE = .021$, $p = .36$, suggesting that distress did not mediate the relationship between post-drinking eating and subsequent intended dietary restriction.

**Post-drinking eating, intended dietary restriction, and subsequent drinking quantity.**

To test whether intended dietary restriction mediates the relationship between post-drinking eating and subsequent drinking quantity, the following analyses were conducted. Intended dietary restriction and post-drinking eating were measured during the morning assessment, while drinking quantity was measured during the random portion of the study. Although post-drinking eating was assessed in the morning, it refers to eating after drinking the night before. To test path a, the following model was used: $\gamma$ (Intended dietary restriction) = $\pi_{00} + \pi_{10}$ (Post-drinking eating) + $r_{1j}$. Results indicated a positive relationship between post-drinking eating and intended dietary restriction ($\pi_{10} = .300$, $SE = .108$, $t (514) = 2.790$, $p = .005$). When women reported eating after drinking, they were more likely to report intended dietary restriction than on days they did not report eating after drinking.

To test path b, the following model was used: $\gamma$ (Drinking quantity) = $\pi_{00} + \pi_{10}$ (Intended dietary restriction) + $r_{1j}$. Intended dietary restriction was entered as a group-centered variable to examine the within-individual variability. Results indicated a positive relationship between intended dietary restriction and drinking quantity, ($\pi_{10} = .412$, $SE = .154$, $t (514) = 2.678$, $p = .008$). A greater intention to restrict one’s caloric intake was associated with consuming larger amounts of alcohol later that day.
To test path c, the following model was used: $\gamma (\text{Drinking quantity}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + r_{ij}$. Results indicated a non-significant relationship between post-drinking eating and subsequent drinking quantity, ($\pi_{10} = .466, SE = .301, t (514) = 1.546, p = .123$).

To test path c’, the following model was used $\gamma (\text{Drinking quantity}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + \pi_{20} (\text{Intended Dietary restriction}) + r_{ij}$. Intended dietary restriction was entered as a group-centered predictor. The relationship between intended dietary restriction and subsequent drinking quantity remained significant ($\pi_{20} = .391, SE = .154, t (513) = 2.534, p = .012$). When women reported greater intended dietary restriction, they consumed larger amounts of alcohol later that day. After including the effects of the mediator, the relationship between post-drinking eating and subsequent drinking quantity remained non-significant, ($\pi_{10} = .403, SE = .299, t (513) = 1.347, p = .178$). Results of the Sobel test (Preacher & Leonardelli, 2015) were non-significant, $Z = 1.93, SE = .064, p = .054$, suggesting that intended dietary restriction did not mediate the relationship between post-drinking eating and subsequent drinking quantity.

**Eating after drinking, intended dietary restriction, and alcohol-related problems.**

To examine whether intended dietary restriction mediates the relationship between eating after drinking and subsequent alcohol-related problems, the following analyses were conducted. Post-drinking eating and intended dietary restriction were assessed during the morning assessment, while the total score for alcohol-related problems was assessed during the random portion of the study. To test path a, the following model was used: $\gamma (\text{Intended dietary restriction}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + r_{ij}$. Results indicated a positive relationship between post-drinking eating and intended dietary restriction ($\pi_{10} = .300, SE = .108, t (514) = 2.790, p = .005$). When women reported eating after drinking, they reported a greater intention to restrict their caloric intake than on days they did not report eating after drinking.
To test path b, the following model was used: $\gamma (\text{Alcohol Problems}) = \pi_{00} + \pi_{10} (\text{Intended Dietary restriction}) + r_{1j}$. Intended dietary restriction was entered as a group-centered variable to examine the within-individual variability. Results indicated a positive relationship between intended dietary restriction and alcohol problems, ($\pi_{10} = .372, SE = .093, t (514) = 3.981, p < .0001$). When women reported greater intended dietary restriction, they experienced greater problems after drinking than when they reported less intended dietary restriction.

To test path c, the following model was used: $\gamma (\text{Alcohol Problems}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + r_{1j}$. Results indicated a positive relationship between post-drinking eating and subsequent alcohol problems, ($\pi_{10} = .588, SE = .195, t (514) = 3.017, p = .003$). On days women reported eating after drinking, they experienced greater problems after drinking than when they did not report eating after drinking.

To test path c’, the following model was used $\gamma (\text{Alcohol Problems}) = \pi_{00} + \pi_{10} (\text{Post-drinking eating}) + \pi_{20} (\text{Intended dietary restriction}) + r_{1j}$. Intended dietary restriction was entered as a group-centered predictor. The relationship between intended dietary restriction and subsequent alcohol problems remained significant, ($\pi_{20} = .346, SE = .094, t (513) = 3.701, p < .0001$). After including the effects of the mediator, the relationship between post-drinking eating and subsequent alcohol problems remained significant, ($\pi_{10} = .513, SE = .193, t (513) = 2.661, p = .008$). Results of the Sobel test (Preacher & Leonardelli, 2015) were not significant, $Z = 1.92, SE = .08, p = .055$, suggesting that intended dietary restriction did not mediate the relationship between post-drinking eating and subsequent alcohol-related problems.

**Aim 5: Figures 2a and 2b**

To test the models depicted in Figures 2a and 2b, the following sets of analyses were conducted. First, state self-regulation was examined as a potential moderator and mediator of the
relationship between intended dietary restriction and alcohol consumption. Second, state self-regulation was examined as a potential moderator and mediator of the relationship between intended dietary restriction and alcohol problems. Third, drinking quantity was examined as a mediator between state self-regulation and alcohol problems. Analyses that examined state self-regulation as a potential moderator of several relationships are presented in Figure 2b, while analyses that examined state self-regulation as a potential mediator of several relationships are presented in Figure 2a. Lastly, alcohol consumption was examined as a potential moderator between intended dietary restriction and alcohol problems, as depicted in Figure 2b.

**Intended dietary restriction, state self-regulation, and drinking quantity.**

State self-regulation was examined as a potential mediator of the relationship between intended dietary restriction and drinking quantity. Higher scores on the state self-regulation item reflect poorer self-regulation.

To test path a between the independent variable to the mediator, the following model was used: $\gamma_1 = \pi_0 + \pi_{10} (\text{Intended dietary restriction}) + r_{ij}$. Results indicated a non-significant relationship between intended dietary restriction and state self-regulation, $(\pi_{10} = .171, SE = .088, t (514) = 1.954, p = .051)$.

To test path b between the mediator to the dependent variable, the following model was used: $\gamma_2 = \pi_0 + \pi_{10} (\text{State Self-regulation}) + r_{ij}$. Results indicated a negative relationship between state self-regulation and the total number of drinks consumed, $(\pi_{10} = -.183, SE = .083, t (514) = -2.201, p = .028)$, suggesting that greater demands on state self-regulation were associated with less alcohol consumption.

To test path c between the independent variable to the dependent variable, the following model was used: $\gamma_3 = \pi_0 + \pi_{10} (\text{Intended dietary restriction}) + r_{ij}$. Results
indicated a positive relationship between intended dietary restriction and the total number of
drinks consumed, \((\pi_{10} = .412, SE = .154, t (514) = 2.678, p = .008)\), suggesting that women who
reported a greater intention to restrict their caloric intake consumed more drinks than when they
reported less intention to restrict their caloric intake.

To test path c’ between the independent variable and the dependent variable after
including the effects of the mediator, the following model was used \(\gamma \) (Drinking Quantity) = \(\pi_{00} + \pi_{10} \) (Intended dietary restriction) + \(\pi_{20} \) (State self-regulation) + \(r_{1j}\). There was a negative
relationship between state self-regulation and drinking quantity, \((\pi_{20} = -.200, SE = .082, t (513) =
-2.435, p = .015)\). After including the effects of the mediator, the relationship between intended
dietary restriction and drinking quantity remained significant, \((\pi_{10} = .443, SE = .153, t (513) =
2.889, p = .004)\). Results of the Sobel test (Preacher & Leonardelli, 2015) were non-significant,
\(Z = 1.613, SE = .047, p = .107\), indicating that state self-regulation did not mediate the
relationship between intended dietary restriction and drinking quantity.

**Intended dietary restriction, state self-regulation, and alcohol-related problems.**

State self-regulation was examined as a potential mediator of the relationship between
intended dietary restriction and alcohol-related problems. To test path a between the
independent variable and the mediator, the following model was used: \(\gamma \) (State Self-regulation) = 
\(\pi_{00} + \pi_{10} \) (Intended dietary restriction) + \(r_{1j}\). Results indicated a non-significant relationship
between intended dietary restriction and state self-regulation, \((\pi_{10} = .171, SE = .088, t (514) =
1.954, p = .051)\).

To test path b between the mediator and dependent variable, the following model was
used: \(\gamma \) (Alcohol problems) = \(\pi_{00} + \pi_{10} \) (State Self-regulation) + \(r_{1j}\). Results indicated a non-
significant between state self-regulation and alcohol problems, (\(\pi_{10} = .028, \ SE = .052, t (514) = .554, p = .580\)).

To test path c between the independent variable and the dependent variable, the following model was used: \(\gamma (\text{Alcohol problems}) = \pi_{00} + \pi_{10} (\text{Intended dietary restriction}) + r_{1j}\). Results indicated a positive between intended dietary restriction and alcohol problems, (\(\pi_{10} = .372, \ SE = .093, t (514) = 3.981, p < .0001\)), suggesting that women who reported a higher intention to restrict their caloric intake experienced greater problems after drinking than women who reported less intention to restrict their caloric intake.

To test path c’ between the independent variable and the dependent variable after accounting for the effects of the interaction term, the following model was used \(\gamma (\text{Alcohol problems}) = \pi_{00} + \pi_{10} (\text{Intended Dietary restriction}) + \pi_{20} (\text{State self-regulation}) + r_{1j}\). The relationship between state self-regulation and alcohol problems was non-significant, (\(\pi_{20} = .012, \ SE = .050, t (513) = .248, p = .804\)). After including the effects of the mediator, the relationship between intended dietary restriction and alcohol problems remained significant, (\(\pi_{10} = .370, \ SE = .094, t (513) = 3.947, p < .0001\)). Results of the Sobel test (Preacher & Leonardelli, 2015) were non-significant, \(Z = 1.742, \ SE = .036, p = .081\), indicating that state self-regulation did not mediate the relationship between intended dietary restriction and alcohol problems.

**State self-regulation, drinking quantity, and alcohol-related problems.**

Drinking quantity was examined as a potential mediator of the relationship between state self-regulation and alcohol-related problems. To test path a between the independent variable and the mediator, the following model was used: \(\gamma (\text{Drinking quantity}) = \pi_{00} + \pi_{10} (\text{State self-regulation}) + r_{1j}\). Results indicated a negative relationship between state self-regulation and
drinking quantity ($\pi_{10} = -0.183$, $SE = 0.083$, $t (514) = -2.201$, $p = .028$), suggesting that higher levels of state self-regulation were associated with less alcohol consumption.

To test path b between the mediator and the dependent variable, the following model was used: $\gamma$ (Alcohol problems) = $\pi_{00} + \pi_{10} \text{ (Drinking quantity)} + r_{1j}$. Results indicated a positive relationship between drinking quantity and alcohol-related problems ($\pi_{10} = .261$, $SE = .070$, $t (514) = 3.716$, $p < .0001$), suggesting that higher amounts of alcohol consumption were associated with greater alcohol-related problems.

To test path c between the independent variable and the dependent variable, the following model was used: $\gamma$ (Alcohol problems) = $\pi_{00} + \pi_{10} \text{ (State self-regulation)} + r_{1j}$. Results indicated a non-significant relationship between state self-regulation and alcohol-related problems, ($\pi_{10} = .072$, $SE = .052$, $t (514) = 1.372$, $p = .171$).

To test path c’ between the independent variable and the dependent variable, after accounting for the effects of the mediator, the following model was used: $\gamma$ (Alcohol problems) = $\pi_{00} + \pi_{10} \text{ (State self-regulation)} + \pi_{20} \text{ (Drinking quantity)} + r_{1j}$. There was a positive relationship between drinking quantity and alcohol problems, ($\pi_{20} = .264$, $SE = .087$, $t (513) = 3.033$, $p = .003$). After including the effects of the mediator, the relationship between state self-regulation and alcohol problems remained non-significant, ($\pi_{10} = .077$, $SE = .046$, $t (513) = 1.654$, $p = .099$). Results of the Sobel test (Preacher & Leonardelli, 2015) were non-significant, $Z = -1.333$, $SE = .011$, $p = .182$, indicating that drinking quantity did not mediate the relationship between state self-regulation and alcohol-related problems.

**Moderator analyses**

Several sets of analyses were conducted to examine moderation, as depicted in Figure 2b. First, drinking quantity was examined as a moderator between intended dietary restriction and
alcohol-related problems. Second, state self-regulation was examined as a moderator between intended dietary restriction and drinking quantity. Lastly, state self-regulation was examined as a moderator between intended dietary restriction and alcohol-related problems.

**Drinking quantity as a moderator between intended dietary restriction and alcohol problems.**

Intended dietary restriction and drinking quantity were entered into the model using group-mean centering. Next, an interaction term between intended dietary restriction and drinking quantity was created using group-mean centering. The following model was used: $\gamma$

$\text{(Alcohol-related problems)} = \pi_{00} + \pi_{10} \text{ (Intended dietary restriction)} + \pi_{20} \text{ (Drinking Quantity)} + \pi_{12} \text{ (Intended dietary restriction} \times \text{Drinking quantity)} + \epsilon_{1j} + \mu_{0j}$.

Results revealed a non-significant coefficient for intended dietary restriction ($\pi_{10} = .236, SE = .143, t \ (512) = 1.655, p = .099$). Meanwhile, drinking quantity ($\pi_{20} = .198, SE = .062, t \ (512) = 3.185, p = .002$) was positively related to alcohol problems. Thus, women who consumed larger amounts of alcohol experienced greater problems after drinking. Lastly, the coefficient for the interaction term was non-significant ($\pi_{30} = .097, SE = .145, t \ (512) = .666, p = .505$), suggesting that drinking quantity did not moderate the relationship between intended dietary restriction and alcohol-related problems.

**State self-regulation as a moderator between intended dietary restriction and drinking quantity.**

Intended dietary restriction and state self-regulation were entered into the model using group-mean centering. Next, an interaction term between intended dietary restriction and state self-regulation was created using group-mean centering. The following model was tested: $\gamma$
(Drinking Quantity) = \pi_{00} + \pi_{10} \text{ (Intended dietary restriction)} + \pi_{20} \text{ (Self-regulation)} + \pi_{12} \text{ (Intended dietary restriction} \times \text{Self-regulation)} + r_{ij} + \mu_{0j}.

Results revealed a positive coefficient for intended dietary restriction (\pi_{10} = .499, SE = .1923, t (512) = 2.601, p = .01), suggesting that women who reported a greater intention to restrict their caloric intake consumed greater amounts of alcohol. Meanwhile, the coefficient for state self-regulation was non-significant, (\pi_{20} = -.176, SE = .096, t (512) = -1.833, p = .067). In addition, the interaction term was non-significant, (\pi_{30} = -.045, SE = .093, t (512) = -.493, p = .622), suggesting that state self-regulation did not moderate the relationship between intended dietary restriction and drinking quantity.

**State self-regulation as a moderator between intended dietary restriction and alcohol problems.**

Intended dietary restriction and state self-regulation were entered into the model using group-mean centering. Next, an interaction term between intended dietary restriction and state self-regulation was created using group-mean centering. The following model was tested: \gamma

(Alcohol Problems) = \pi_{00} + \pi_{10} \text{ (Intended dietary restriction)} + \pi_{20} \text{ (Self-regulation)} + \pi_{12} \text{ (Intended dietary restriction} \times \text{Self-regulation)} + r_{ij} + \mu_{0j}.

Results revealed a positive coefficient for intended dietary restriction, (\pi_{10} = .467, SE = .161, t (512) = 2.901, p = .004). Meanwhile, there was a non-significant coefficient for state self-regulation, (\pi_{20} = .060, SE = .081, t (512) = .735, p = .463). In addition, the interaction term was non-significant, (\pi_{30} = -.023, SE = .031, t (512) = -.740, p = .460), suggesting that state self-regulation did not moderate the relationship between intended dietary restriction and alcohol problems.
Post-hoc analyses

Several sets of post-hoc analyses were conducted given the concerns about several constructs that were used to test the model depicted in Figure 1. Thus, there were concerns about what intended dietary restriction and state self-regulation were actually measuring. First, a post-hoc analysis was conducted to examine the relationship between a self-report measure of dietary restraint assessed at baseline, the Revised Restraint Scale (RRS; Herman & Polivy, 1980), and intended dietary restriction measured during the palm pilot portion of the study. Results indicated a positive relationship between the RRS and intended dietary restriction, ($\pi_{01} = .09, SE = .017, t (57) = 5.191, p < .0001$), suggesting that women who reported greater dietary restraint on a self-report inventory were more likely to report intended caloric restriction.

Second, there were concerns about reported alcohol consumption by this sample. The eligibility criteria for this study included selecting women to participate if they engaged in moderate levels of alcohol consumption (NIAAA, 2013). Women completed ratings of their alcohol consumption 82.5% of the time ($n = 473$), out of 573 total drinking observations. Of these 473 drinking observations, they consumed alcohol 22.8% ($n = 108$) of the time, and denied consuming alcohol 77.2% of the time ($n = 365$). In addition, women in this study missed prompts regarding their alcohol consumption 17.5% ($n = 100$) of the time. On average, women reported consuming 1.1 drinks ($SD = 2.43$) per day.

Lastly, the assessment of state self-regulation in this study may not have accurately depicted the strength model of self-regulation (e.g., Baumeister, 2003; Baumeister & Heatherton, 1996). A post-hoc analysis was conducted to examine the relationship between state self-regulation and a self-report measure of state regulation which was assessed at baseline (i.e., SSRQ; Carey et al., 2004; Neal & Carey, 2005). Results indicated a non-significant relationship
between the SSRQ and state self-regulation, \( \pi_{01} = .029, SE, = .018, t (56) = 1.664, p = .102 \), suggesting that the assessment of state self-regulation in this study may be discrepant from prior research that has assessed self-regulation at baseline.
CHAPTER 4
DISCUSSION

Co-occurrence between intended dietary restriction, alcohol behaviors, and post-drinking eating.

This study had several aims. A primary aim of this study was to extend the existing literature that has examined the co-occurrence between eating and drinking behavior, as depicted by the model in Figure 1. Several sets of analyses were conducted to examine this model. First, to extend prior cross-sectional research (Buchholz et al., 2012) that has found that restrained eaters experience greater problems after drinking due to their greater alcohol consumption, drinking quantity was examined as a potential mediator of the relationship between intended dietary restriction and alcohol problems. Alcohol consumption partially mediated the relationship between intended dietary restriction and alcohol problems. Thus, women who reported a higher intention to restrict their caloric intake experienced more problems after drinking due to their increased alcohol consumption.

Due to the inconsistent findings regarding the role of alcohol as a disinhibitor of dietary restraint (Buchholz, Luce, et al., 2015; Polivy & Herman, 1976a, 1976b), another aim of this study was to clarify the nature of the relationship between intended dietary restriction, alcohol consumption, and subsequent post-drinking eating. Intended dietary restriction was positively associated with alcohol consumption, while consuming greater amounts of alcohol was
associated with a 1.4 times increased likelihood of eating after drinking. In addition, post-drinking eating was associated with greater subsequent intended dietary restriction. However, post-drinking eating did not mediate the relationship between alcohol consumption and subsequent intended dietary restriction. This study extends prior literature which has found that restrained eaters consumed more food after drinking (Buchholz, Luce, et al., 2015; Polivy & Herman, 1976b), by highlighting that alcohol consumption increases the likelihood that an individual will eat after drinking, which in turn increases the likelihood of subsequent dietary restraint, possibly as a means of regaining control over their caloric intake (Fairburn, 2008).

Furthermore, results indicated that alcohol consumption was associated with greater alcohol problems and a greater likelihood of eating after drinking. Results indicated that experiencing greater problems after drinking was associated with a 1.3 times greater likelihood of eating after drinking. It may be that alcohol problems and post-drinking eating are salient consequences for women, particularly those who are concerned with their caloric intake. Thus, one possibility for these findings is eating after drinking produces a maladaptive feedback loop with women restricting their caloric intake to regain control over their eating, leading to increased problems due to their decreased caloric intake.

Clearly, some of the most interesting findings involve the direct paths between intended dietary restriction and alcohol consumption, between alcohol consumption and alcohol-problems and post-drinking eating, and between post-drinking eating and intended dietary restriction. Women who rated a higher intention to restrict their caloric intake consumed greater amounts of alcohol, which lead them to experience more problems after drinking, and a greater likelihood of eating after drinking. Given that women who intend to restrict their caloric intake spend a substantial amount of time monitoring the amount and types of food consumed (Herman &
Mack, 1975), one possibility is women who intend to restrict their caloric intake consume more alcohol to shift their attention away from their concern regarding their caloric intake. Similarly, the LVE purports that individuals who violate a self-imposed limit on their alcohol intake are at a heightened risk of consuming large amounts of alcohol (Marlatt & Gordon, 1980). Thus, these women may have perceived a violation of their dietary rules as a result of their increased alcohol intake, which led to further violations of their dietary rules including eating after drinking. As a means to regain control over their perceived violation of their caloric intake (Fairburn, 2008), these women engaged in further restriction of their caloric intake. These findings are consistent with the literature examining the use of weight management strategies in anticipation of and following one’s alcohol consumption (Piazza-Barry & Gardner, 2013).

Paradoxically, alcohol is a calorically-dense beverage (Dennis et al., 2009), which may increase the amount of attention devoted to one’s alcohol consumption and caloric intake, particularly for women who chronically monitor their caloric intake. Due to the increased attention devoted to monitoring their caloric intake, one might expect women who intend to restrict their caloric intake to experience increased distress regarding their eating and drinking habits. This did not occur. Interestingly, greater distress was associated with less intended dietary restriction. One possibility for the negative relationship between distress and intended dietary restriction is women who intend to restrict their caloric intake may have limited healthy coping strategies for regulating their distress. Thus, they may be conflicted with making a decision to engage in caloric restriction or using food to self-soothe their distress.
Furthermore, post-drinking eating was unrelated to subsequent distress, and distress did not mediate the relationship between post-drinking eating and subsequent intended dietary restriction. There are several explanations for these findings. First, the assessment of distress in the morning may not have accurately captured the association between post-drinking eating and distress experienced during the eating episode the night before. Second, an individual’s affect may have improved the morning following an episode of eating after drinking. Along a similar vein, the capacity to make decisions about behavior change, i.e., state self-regulation, may lend explanation to the difficulty with regulating multiple behaviors.

**State self-regulation**

A secondary aim of this study was to examine state self-regulation as a potential mediator and moderator of the relationships between intended dietary restriction and drinking quantity; and intended dietary restriction and alcohol problems. In addition, drinking quantity was examined as a potential mediator between state self-regulation and alcohol problems. State self-regulation did not significantly mediate or moderate the relationship between intended dietary restriction and drinking quantity, or between intended dietary restriction and alcohol problems. In addition, drinking quantity did not mediate the relationship between state self-regulation and alcohol problems. None of the hypotheses regarding state self-regulation as a mediator or moderator were supported.

When examining state self-regulation alone, it is negatively associated with drinking. Thus, *higher* levels of state self-regulation were associated with *less* alcohol consumption. This finding is counterintuitive with the strength model of self-regulation (e.g., Baumeister, 2003; Baumeister & Heatherton, 1996), which posits that greater demands on one’s self-regulatory capacity (i.e., greater state self-regulation) are associated with *greater* alcohol consumption. One
explanation for the negative relationship between state self-regulation and alcohol consumption is women may not drink or may *drink less* due to the context of the greater resource demands assessed by the state self-regulation items. For example, if women have to study and they do not want to, those types of demands may not be as strongly associated with greater alcohol consumption.

In contrast, intended dietary restriction is associated with greater alcohol consumption. Thus, one explanation is that dietary restriction is placing *greater demands* on self-regulatory capacity than other activities, which increases the likelihood of greater alcohol consumption. Indeed, these women spend a significant amount of time devoted towards monitoring their caloric intake. An alternative, though related explanation, is that these women may intend to restrict their caloric intake before drinking as a method of weight control, due to the high caloric content of alcohol, which may increase demands on self-regulatory capacity.

There may be conceptual and methodological reasons for the pattern of findings involving state self-regulation. Regardless of the level of intoxication, research using EMA methodology has found that the Short State Self-Regulation Questionnaire (SSRQ) was associated with an increased likelihood of alcohol-related problems (Neal & Carey, 2007). However, the post-hoc analysis that examined the relationship between state self-regulation and a self-report measure of self-regulation assessed at baseline (i.e., SSRQ; Carey et al., 2004; Neal & Carey, 2005) was non-significant. Thus, there may be important methodological differences between the assessment of self-regulation at baseline versus in the moment. A second explanation for the pattern of findings involving state self-regulation is the assessment of state self-regulation in this study may not have adequately captured the construct of state self-regulation since it was designed to assess an individual’s anticipated demands on their capacity...
versus actual goal-directed behavior, as measured by the SSRQ. Finally, self-regulation may be a more salient predictor for proximal behavior (i.e., alcohol consumption), rather than distal behavior (i.e., alcohol problems). Results of this study support this finding; poorer state self-regulation was associated with less alcohol consumption, while state self-regulation was unrelated to alcohol problems. Given that alcohol impacts one’s awareness (Steele & Josephs, 1990), these individuals may be less aware of the consequences stemming from heavy drinking in the moment, and are more concerned with the number of drinks they are consuming as compared to the prospective consequences of their intoxication.

**Examination of dietary restriction**

Lastly, a third aim of this study was to examine several constructs. First, the construct of intended dietary restriction was examined. It was anticipated that a greater intention to restrict one’s caloric intake would be associated with fewer eating episodes than a lesser intention to restrict one’s caloric intake, consistent with the findings by Luce and colleagues (2013). These results were not supported. Intended dietary restriction was unrelated to the number of eating episodes or to the quantity of food consumed.

There are several theoretical explanations for these discrepant findings in the assessment of dietary restraint. One theoretical explanation for these findings is based on the existing literature that has examined the intention versus behavior gap. The Theory of Planned Behavior (Ajzen, 1991) posits that the relationship between intended versus actual behavior can be explained by various factors. For instance, an individual’s intention to engage in a behavior can be determined by motivational factors that influence his/her intention including his/her attitudes towards that behavior, subjective norms, and his/her perceived behavioral control. Subjective norms refer to the perceived acceptability of a behavior by others, while perceived behavioral
control refers to an individual’s subjective evaluation of their ability to engage in a specific behavior (Ajzen, 1991). Thus, if an individual intends to restrict his/her caloric intake, experiences pressure to restrict, and believes he/she has the ability to restrict, then he/she will engage in caloric restriction. A meta-analysis examined these tenets of the Theory of Planned Behavior. Results indicated that attitudes, subjective norms, and perceived behavioral control accounted for 39% of the variance in intention. However, perceived behavioral control alone accounted for 18% of the variance in intention, and 13% of the variance in behavior (Armitage & Conner, 2001). Given that perceived behavioral control is purported to develop based on an individual’s prior experiences with a specific behavior (Ajzen, 1991), one possibility for the non-significant relationship between intended versus actual dietary restraint is an individual’s previous unsuccessful attempts at dieting and/or weight loss may have influenced their perceived behavioral control, which in turn, decreased their likelihood of engaging in actual restriction of their caloric intake.

However, the relationship between intended eating behavior and actual eating behavior is not always so clear. Several authors have argued that self-reported caloric intake is not isomorphic with actual caloric restriction (Goldstein et al., 2013; Stice et al., 2010). Thus, the assessment of intended dietary restriction in the current study may not generalize to the actual restriction of a woman’s caloric intake in her naturalistic environment, which was supported by the non-significant relationship between intended dietary restriction and the amount of food consumed.

Apart from the aforementioned theoretical and conceptual implications, there may be several methodological explanations for these findings. Luce and colleagues (2013) asked participants to complete paper and pencil diaries for each eating and drinking episode for 10
days. Meanwhile, this study gathered information regarding a woman’s eating and drinking habits for 10 days. It used a palm pilot device. Although research has argued that paper and pencil questionnaires have equivalent psychometric properties to electronic devices (Green et al., 2006), other researchers have questioned whether these methods yield similar findings (Broderick & Stone, 2006; Takarangi et al., 2006; Tennent et al., 2006). In addition, Luce and colleagues (2013) obtained information about a woman’s caloric intake by instructing individuals to complete diaries for every eating and drinking episode. On the other hand, this study obtained information about a woman’s caloric intake through the use of random sampling. This difference in fixed versus random-sampling (Shiffman et al., 2008) may lend explanation to the non-significant results examining intended versus actual dietary restriction.

Another methodological explanation for these findings is the possibility that the relationship between intended dietary restriction and eating episodes was obscured by missing data for eating episodes. Although the palm pilots were programmed to allow participants to delay a prompt while they were busy, participants could have missed the assessment of their eating behavior for various reasons. For instance, they may have heard a prompt but decided not to answer, subsequently did not eat between that prompt and the next, and rated their eating behavior as a 0. The findings presented in Table 2 support the contention for missing eating episodes, given the low frequency of reporting consumption of snacks and meals. This suggests that the assessment of the number of eating episodes and quantity of food consumed in the current study may not have accurately depicted a woman’s eating patterns.

Although the findings examining intended dietary restriction in relation to the quantity of food consumed may seem counterintuitive, they are consistent with existing literature on eating behavior. Restraint theory argues that some women are successful at maintaining their dietary
restraint, while others are less successful at maintaining their dietary restraint (Herman & Mack, 1975). In other words, on days women intend to restrict their caloric intake, some may actually consume less food (i.e., successful restrained eaters), while others may eat more or the same amount of food (i.e., unsuccessful restrained eaters). In a seminal review, Lowe (1993) proposed several explanations for identifying which individuals are successful with maintaining their dieting behavior. One possible explanation for identifying individuals who are successful with maintaining dieting behavior is to examine an individual’s idiosyncratic rules regarding dieting. In other words, an individual’s perception of a violation of their caloric intake is more salient than the total calories they consumed.

Recently, researchers have proposed a new theory of eating behavior, known as the goal conflict model, to elucidate the factors associated with the maintenance and disinhibition of dietary restraint (Stroebe, van Koningsbruggen, Papes, & Aarts, 2013). According to this theory, restrained eaters experience greater difficulty with regulating their caloric intake due to a conflict between two opposing goals, namely eating enjoyment and weight control. Thus, if one’s weight control goal is in conflict with the pleasure associated with consuming highly caloric foods, the individual will not be successful with maintaining their dietary restraint. On the other hand, if one’s weight control goal is not in conflict with eating enjoyment, then the individual will be successful with maintaining their dietary restraint. Based upon the goal conflict model (Stroebe et al., 2013), one possibility for these non-significant findings is there may be separate clusters of women within this sample. Some women may be successful with maintaining their restraint by consuming less food, while others may be unsuccessful with maintaining their restraint by consuming more food.
Caloric restriction on drinking days

Because prior research has found that women were more likely to restrict their caloric intake (Giles et al., 2009) and engage in fewer eating episodes (Luce et al., 2013) on days they drink versus non-drinking days, it was hypothesized that intention to restrict one’s caloric intake would be more likely to occur on drinking days as compared to non-drinking days. These results were not supported; women were not more or less likely to restrict on days that they drank. There are several explanations for these findings. First, one possibility is that a woman’s self-reported intention to engage in caloric restriction may not directly translate into actual caloric restriction (Goldstein et al., 2013; Stice et al., 2010). Thus, a woman may have initially rated her intention to restrict her caloric intake as high in the morning, and her intention may have changed throughout the day.

Although the original hypotheses examining increased caloric restriction on drinking days was not supported, results of this study shed light on several factors that may be associated with caloric restriction on drinking days. The explanations women provided for restricting their caloric intake on drinking days may be important in understanding the relationship between increased caloric restriction on drinking days. The most common reasons women provided for restricting their caloric intake in this study were due to concerns with their weight and appearance, and to avoid feeling heavy and full. These findings were consistent with prior cross-sectional data which found the most common reasons women restricted their caloric intake on drinking days were due to weight concern, to avoid getting drunk, and to avoid getting sick (Giles et al., 2009). In addition, the types of drinks women reported consuming may be informative to understanding the relationship between increased caloric restriction on drinking days. According to the findings presented in Table 4, women in this sample reported consuming
alcoholic beverages with fewer calories such as mixed drinks, light beer, and wine. Thus, these women may be more concerned with the *types of* drinks they consume as opposed to the *amount* and *frequency* of their alcohol consumption.

**Limitations**

One potential limitation is the results of this study may not be generalizable to other samples, due to the predominantly homogeneous nature of the sample. This study used a predominantly Caucasian sample of female college students. Future research should examine these findings in other groups to determine if the models depicted in Figures 1, 2a, and 2b are the same for other ethnic groups and men. However, given that women are more likely than men to engage in dietary restraint of their caloric intake (Keel et al., 2007), this study may have different implications for predominantly male samples.

Another potential limitation of this study is self-report bias. First, the completion of the assessments may have led to unintended findings, by producing participant burden as participants were instructed to carry an additional device while drinking. Second, participants in this study may have intentionally omitted the completion of assessments on the palm pilot for various reasons. There were also concerns about women’s reported alcohol consumption in this study. The average time for a drinking episode in this study was 6:41 p.m. (SD = 03:28 hours), which is inconsistent with prior research. Field studies which gather information about an individual’s alcohol consumption in their naturalistic environment (i.e., a bar), typically between the hours of 10 p.m. to 2:30 a.m. (Buchholz, Crowther, Olds, Smith, & Ridolfi, 2013). Given these findings, it is possible that women in this study did not honestly report their alcohol consumption. An alternative explanation is that women in this study honestly reported their alcohol consumption; however, information regarding their alcohol consumption was not
obtained across two weekends of data collection. Given that college students consume higher amounts of alcohol on the weekends versus weekdays (e.g., Neal & Carey, 2007; Neighbors et al., 2011), the amount of alcohol women reported in this sample may be inaccurate, since information was only obtained for the duration of one weekend of drinking. Nevertheless, one benefit of using EMA is the decreased likelihood of self-report bias (Shiffman et al., 2008).

Another potential limitation was the risk of participant burden due to the length of the study design. However, the duration of this study was 10 days, which is consistent with prior research examining the relationship between eating and drinking behavior among college women (Luce et al., 2013). In addition, the compliance rates for this study were consistent with prior EMA research using an event-contingent and signal-contingent design (Muraven et al., 2005a; Muraven et al., 2005b).

Furthermore, the assessment of a woman’s caloric intake in her naturalistic environment is difficult to obtain given the lack of current technology to gather this information. Research examining a woman’s caloric intake in her naturalistic environment has utilized paper and pencil diaries, which were converted into calories using a software program (Luce et al., 2013; Buchholz, Luce, et al., 2015). Another study had participants call a phone number to report their caloric intake for the past 24-hours (Burd et al., 2009). Recently, researchers have developed a novel technique to assess caloric intake in an individual’s naturalistic environment by having individuals take pictures of the food they consume using a cell-phone. This technique has good psychometric properties (Martin et al., 2009), but has not been incorporated into existing EMA research.
Future Directions and Implications

Future research could build upon the current study in various ways. First, the assessment of intended dietary restriction in the current study was unrelated to the number of eating episodes and the quantity of food consumed. One suggestion for future research is to instruct participants to rate the number of eating episodes and additional information at the end of the day or the next morning, in order to assess their reported eating behavior. Prior research has instructed participants to complete surveys of their alcohol consumption and intentions for the following day using an EMA design, and yielded good compliance information (Muraven et al., 2005a; Muraven et al., 2005b).

Given that there was a positive relationship between a self-report inventory of dietary restraint and intended dietary restriction, future research should examine the best method of assessing dietary restraint in a woman’s naturalistic environment. For instance, a state measure of dietary restraint could be developed to assess a woman’s actual caloric restriction. Due to recent technological advances, another suggestion for future research is to examine the relationship between eating and drinking behavior using smartphones to obtain more accurate information about a woman’s caloric intake throughout the day. Among adults aged 18 to 24, 67% owned a smartphone in 2012 (Smith, 2012). Furthermore, a recent publication by the American Psychological Association demonstrated the increased use of mobile technology for therapeutic services (Miller, 2014). Thus, this improvement in recent technology could assist researchers and clinicians with identifying individuals who are engaging in risky drinking and eating behaviors and provide feedback in the moment to prevent harm.

Furthermore, it would be beneficial for future research to extend the current study by examining the models depicted in Figures 1, 2a, and 2b among individuals with clinically
significant, comorbid levels of eating pathology and substance use problems. Given that EMA designs allow researchers to test prospective relationships between relevant constructs as they occur in an individual’s naturalistic environment (Shiffman et al., 2008), future research could examine the genetic pathways associated with the co-occurrence between eating and drinking behavior. Biological factors, such as genetics, have emerged as important constructs in the examination of psychopathology. According to the diathesis-stress model (Monroe & Simons, 1991), an individual is prone to develop psychological disorders due to a combination of genetic and environmental factors. Although research has argued that eating behavior and alcohol use often co-occur (Gadalla & Piran, 2007), only one study has examined the genetic pathways associated with eating and alcohol behavior (Munn-Chernoff et al., 2013). These authors examined the genetic and environmental factors associated with alcohol dependence, binge eating, and compensatory behaviors using a large sample of twins. Overall, genetic factors accounted for 38% to 53% of the variance for alcohol dependence, binge eating, and compensatory behaviors among women (Munn-Chernoff et al.). Thus, genetic factors may lend explanation to the co-occurrence of these behaviors among women. Given the changes in grant funding through agencies such as the National Institute of Mental Health, future research should continue to examine potential biomarkers which may lend explanation to the co-occurrence between eating and alcohol use.

Lastly, a majority of the literature examining self-regulation in relation to alcohol consumption and alcohol-related problems has utilized the strength model of self-regulation (e.g., Baumeister, 2003; Baumeister & Heatherton, 1996), in which self-regulation is viewed as having a limited capacity that becomes depleted over time. It may be that the assessment of state self-regulation at a single time point in this study did not accurately capture the strength model of
self-regulation, in which one’s self-regulatory capacity becomes depleted over time (e.g., Baumeister & Heatherton, 1996; Baumeister, 2003). An alternative explanation to this theory is the notion of self-regulatory success in which an individual meets her intended goal. For instance, a woman may intend to restrict her caloric intake earlier in the day to allow herself to consume a specific number of drinks later in the day. If this behavior occurs, she has met her goal, and thus her behavior is viewed as a “success.” Future research should examine motivational factors, such as goal setting, as it relates to the relationship between eating and drinking behavior to determine if women meet their intended behavioral goals.

Several findings from this research have important implications for the prevention of risky drinking behaviors. First, existing interventions could be tailored to this group of women. Brief interventions for college students utilize harm reduction principles (Dimeff, Baer, Kivlahan, & Marlatt, 1999; Larimer & Cronce, 2007) to decrease rates of binge drinking and subsequent engagement in risky behaviors. For instance, individuals are encouraged to utilize safer techniques while drinking, such as eating before drinking, pacing between alcoholic and non-alcoholic beverages, and putting ice in one’s drinks (Dimeff et al., 1999). Given that this study recruited a sample of moderate-risky drinkers (NIAAA, 2013), existing interventions using harm reduction principles could be tailored to this group of women, by emphasizing the maladaptive association between appearance concerns and alcohol consumption. Because some of these women reported intended dietary restriction, and food buffers the absorption rate of alcohol into the blood stream (Kai-Li, Yin, Crabb, O’Connor, & Ramchadani, 2001), one possibility is these women may become intoxicated more quickly than women who do not intend to restrict their caloric intake. Due to their increased intoxication, these women may be at a greater risk of experiencing problems after drinking than women with less caloric restraint.
Another target for intervention is to identify those individuals who are less able to regulate their emotions and behaviors throughout the day by increasing their awareness of the demands on their state self-regulatory capacity. Higher levels of alcohol consumption were associated with experiencing greater problems after drinking, consistent with prior research (e.g., Perkins, 2002). One possible avenue for intervention is to incorporate the use of protective behavioral strategies to prevent harm. Protective behavioral strategies are techniques designed to reduce problematic drinking consequences, such as setting limits prior to drinking, alternating between alcohol and non-alcoholic drinks, and avoiding drinking games (Martens, Ferrier, Sheehy, Corbett, Anderson, & Simmons, 2005). Among individuals who reported using fewer protective behavioral strategies, self-regulation was associated with experiencing greater problems after drinking as compared to individuals with a higher use of protective behavioral strategies (D’Lima et al., 2012). Thus, assisting individuals with understanding the demands of intended dietary restriction on their self-regulatory capacity, in conjunction with protective behavioral strategies, may prevent harm after drinking.

Incorporating the relationship between demands on self-regulatory capacity and level of alcohol consumption is another potential target for existing interventions. In particular, targeting light drinkers to adopt safer drinking habits may be a fruitful avenue of research. Individuals who consumed less alcohol experienced higher levels of self-control as compared to moderate drinkers, heavy drinkers, and problem drinkers (Kuvaas, Dvorak, Pearson, Lamis, & Sargent, 2014). However, less alcohol consumption has been associated with a greater increase in the risk of experiencing alcohol problems as compared to moderate and heavy drinkers (Neal & Carey, 2007). Although prior prospective research has generally supported that higher levels of self-regulation are associated with experiencing fewer problems after drinking (Hustad et al., 2009;
Neal & Carey, 2007), the level of intoxication may be more salient in identifying who is at risk of subsequent problems. Among light drinkers, the probability of experiencing problems after drinking at the highest level of intoxication (BAC = .20) was .91 for individuals with low levels of self-regulation, and .77 for individuals with high levels of self-regulation. These differences became less pronounced as the risk associated with drinking increased (Neal & Carey, 2007).

**Conclusion**

This study adds to the existing literature by extending previous research (Buchholz et al., 2012; Krahn et al., 1992; Krahn et al., 2005; Stewart et al., 2000) that has examined the relationships between dietary restraint, alcohol consumption, and problems using cross-sectional data. According to Maxwell and Cole (2007), using a cross-sectional design to test mediation can produce biased estimates of the actual longitudinal relationships among the parameters. This study has important implications because it tested these relationships prospectively, thus reducing the likelihood of producing biased estimates of the effects. In addition, this study added to the existing body of literature by examining several potential mechanisms associated in the relationships between dietary restraint, alcohol consumption, and alcohol-related problems. Although the mechanisms examined in this study did not reveal any significant findings, future research would benefit by replicating this study to determine if the results are generalizable to other populations.

This study also clarifies the disinhibition of dietary restraint (Buchholz, Luce, et al., 2015; Polivy & Herman, 1976a; Polivy & Herman, 1976b) by examining alcohol consumption and distress as potential explanatory variables as they occur in a woman’s naturalistic environment. The reciprocal relationship between post-drinking eating and alcohol problems is an important extension of prior literature that has examined the disinhibition of dietary restraint.
Lastly, to my knowledge, this is the first study to examine self-regulation as a potential moderator and mediator concurrently with eating and drinking behavior using EMA. Future research should extend these findings by examining body dissatisfaction in relation to caloric restriction and alcohol consumption. Furthermore, future research should extend these findings by examining genetic factors as it relates to the co-occurrence between eating and drinking behavior.

Taken together, these results revealed several interesting patterns, which partially supports the model depicted in Figure 1. Women who reported a greater intention to restrict their caloric intake consumed higher amounts of alcohol, and experienced greater alcohol-related problems. Similarly, higher amounts of alcohol consumption were associated with greater alcohol-related problems. Thus, intending to restrict one’s caloric intake and greater alcohol consumption were individually associated with experiencing more problems after drinking. Upon examination of the disinhibition of dietary restraint, higher amounts of alcohol consumption were associated with an increased likelihood of eating after drinking, while eating after drinking was associated with a greater intention to restrict one’s caloric intake. Thus, the consumption of alcohol may produce a negative feedback loop by which a woman eats after drinking, and thinks about restricting her caloric intake as a possible means of regaining control over her eating. Similarly, eating after drinking subsequently was associated with greater alcohol consumption and greater alcohol-related problems. Thus, eating after drinking may violate a woman’s self-imposed dietary rules, leading to the use of other maladaptive behaviors, namely increased alcohol consumption and problems after drinking.
References


to be presented at the 46th Convention of the Association for Behavioral and Cognitive Therapies, National Harbor, MD.


Crawford, J.R., & Henry, J.D. (2004). The positive and negative affect schedule (PANAS): Construct validity, measurement properties, and normative data in a large non-clinical


Smith, A. (2012). *Forty-six percent of American adults are smartphone owners: Smartphone users now outnumber users of more basic mobile phones within the national adult population.* Retrieved from Pew Research Center’s Internet and American Life Project


Appendices
Appendix A

Consent form.

Daily health behaviors among college students
Laura J. Buchholz & Dr. Janis H. Crowther

You are being invited to participate in a research study, which will include approximately 100 participants. Your participation is voluntary and you may choose not to participate and stop at any time. Please read this form carefully. It is important that you ask any questions and fully understand the research, prior to making an informed decision. I want to research the daily behaviors people engage in when they consume alcohol, such as changes in patterns of eating, exercise, and body image. I want to do this because understanding why people engage in these behaviors when drinking will help us to promote safer drinking habits. I also want to do this to identify individuals at risk of experiencing negative consequences after drinking.

If you decide to participate, you will be invited to the laboratory on two separate occasions. The initial appointment will take approximately one and a half hours, in which your height and weight will be measured. You will also be asked to complete questionnaires regarding your alcohol use, eating habits, and exercise patterns on a computer. Next, we will provide you with a palm pilot and explain its use. This device is programmed to prompt you take a brief five minute survey, five times a day between the hours of 12pm and 1am. You may turn off the alarm during these times if it would otherwise be problematic (e.g., while driving). Additionally, you will initiate a brief five minute prompt each morning between 9am and 12pm. We are asking you to carry this device with you at all times for ten days. The palm pilot questionnaires assess your current mood, alcohol use, eating behavior, and exercise behavior. After the assessment, you will return your palm pilot to us and we will delete your data as soon as we download it to our system. In addition, you will be asked to complete questionnaires regarding your alcohol use, eating habits, and exercise patterns on a computer and your height and weight will be re-measured.

If you decide to participate in this study, it is unlikely that you will receive any direct benefit from your participation. However, the general population and the scientific community may benefit if the data can be used to increase knowledge about the behaviors people engage in while drinking, and prevent risk of experiencing negative consequences. In exchange for your participation in this study, you will receive three research credits for the questionnaire portion of the study and six research credits for the palm portion of the study. You will also receive a small compensation according to your level of compliance for the palm portion of the study (i.e., 0-25% = $8, 25-50% = $10, 50-75% = $12).

During your participation in this study, it is possible that you may experience some psychological and emotional distress due to the disclosure of sensitive information such as your patterns of alcohol use, exercise habits, and eating habits. If you feel uncomfortable at any time, you may call psychological services at (tel. 330-672-2487) or the psychological clinic at (tel.
The Town Hall II Help Line (tel. 330-678-4357) is also available 24 hours a day, 7 days a week. It is unlikely that you will experience any physical injury and economic risks from your participation in this study.

Any information which you provide in this study will be kept confidential, unless you indicate harm to yourself or to others. All of your responses will be stored on a secure computer network which is only identifiable with a numerical code. Any information linking your name to the data will be stored on a separate computer, which will be destroyed upon completion of this study. Rest assured that any of the data gathered from this study will be presented to the scientific community in aggregate form, and will not be presented in a way which can be identified for a specific individual. Please note, that your research information may be disclosed under specific circumstances, to the Kent State University Institutional Review Board or to certain federal agencies.

If you have any questions and what to know further information on this study, you may contact me at 330-672-2231 or Dr. Janis Crowther 330-672-2090. This project has been approved by the Kent State University Institutional Review Board. If you have any questions regarding your rights as a research participant or have complaints pertaining to this study, you may contact the IRB at (tel. 330-672-2704).

You will receive a copy of this consent form.

Sincerely,
Laura J. Buchholz, M.A. Janis H. Crowther, Ph.D.
Graduate Student Professor
Department of Psychology Department of Psychology
Kent State University Kent State University

CONSENT STATEMENT

1. I am at least 18 years of age and voluntarily agree to participate in this study. I understand what I will have to do and that I can stop at any time.

__________________________________________  Date
Signature

2. I acknowledge that I will be responsible for the cost of the Palm Pilot ($ 200) if it is lost, or damaged due to my own negligence.

__________________________________________  Date
Signature
Appendix B

Demographic Questionnaire.

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How old are you?</td>
<td>4,000 Years</td>
</tr>
<tr>
<td>2. What year of college are you in? (Check one)</td>
<td>4,000 Freshman, 4,000 Sophomore,</td>
</tr>
<tr>
<td></td>
<td>4,000 Junior, 4,000 Senior</td>
</tr>
<tr>
<td>3. What racial or ethnic group best describes you? (Check all that apply)</td>
<td>4,000 Asian, 4,000 Black/African American, 4,000 Native American/Alaskan, 4,000 Pacific Islander, 4,000 White/Caucasian, 4,000 Hispanic, 4,000 Latina Other: please specify ________</td>
</tr>
</tbody>
</table>
### Appendix C

**Morning Assessment.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How likely are you to restrict your caloric intake today?</td>
<td>1 (Not at all) 2 3 4 5 (Extremely)</td>
</tr>
<tr>
<td>2. How (___) are you feeling right now?*</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>* Participants rated each adjective separately to assess negative affect PANAS (Watson et al., 1988): irritable, distressed, ashamed, upset, nervous, guilty, scared, hostile, jittery, and afraid.</td>
<td></td>
</tr>
<tr>
<td>3. Do you plan on drinking alcohol tonight?</td>
<td>1 = Yes 0 = No 2 = Unsure, I’ll see what happens</td>
</tr>
<tr>
<td>4. To what extent are you forcing yourself to DO something you did NOT want to do today?</td>
<td>1 (Not at all) 2 3 4 5 (Extremely)</td>
</tr>
<tr>
<td>5. To what extent are you forcing yourself to NOT do something you want to do today?</td>
<td>1 (Not at all) 2 3 4 5 (Extremely)</td>
</tr>
<tr>
<td>6. Did you eat after drinking last night?</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>If answered yes to # 6, did you consume more, less, or about the same amount of food after drinking?</td>
<td>More Less About the same</td>
</tr>
</tbody>
</table>
## Appendix D

### Random prompts.

<table>
<thead>
<tr>
<th>Question</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How much alcohol have you consumed since the last assessment?</td>
<td>0 drinks to 11 + drinks</td>
</tr>
<tr>
<td>2. Have any of the following happened since the last assessment?</td>
<td></td>
</tr>
<tr>
<td>Neglected responsibilities</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Spent too much money</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Got into a verbal (not physical) fight or argument</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Got into a physical fight</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Family/friends concerned about your behavior</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Relationship harmed due to your behavior</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Felt hungover</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Hurt or injured</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>Did something you regret</td>
<td>1 = Yes 0 = No</td>
</tr>
<tr>
<td>3. Did you eat after drinking?</td>
<td></td>
</tr>
<tr>
<td>Did you consume more, less, or about the same amount of food after drinking?</td>
<td>More Less About the same</td>
</tr>
<tr>
<td>4. Did you engage in fasting to remove excess calories that you ingested?</td>
<td>1 = Yes 0 = No</td>
</tr>
</tbody>
</table>