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The Importance of Restraint in Gauging the Effects of Ego Depletion on Alcohol Motivation

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by

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(Under the Direction of Jessica J. Brooks)

ABSTRACT

Despite increased awareness of complications, the use and abuse of alcohol remains a problem in the United States. With regard to drinking, individuals encounter situations in which they must maintain a balance between temptation to drink and the need to regulate alcohol intake. Maintaining this balance requires the use of self-control. For this reason, lack of self-control has been implicated a potential influence on excessive alcohol consumption. The Strength Model of Self-Control (Baumeister, Vohs, & Tice, 2007) posits that self-control draws on a limited resource that becomes depleted following repeated use. The term "ego depletion" is used to refer to this temporary loss of self-control. The current study examined the effect of ego depletion on alcohol-related cognitions to determine if the strength of alcohol-related cognitions is affected by temporary loss of self-control, as well as if its effects can be gauged using an implicit measure of alcohol motivation. There was not a significant effect of ego depletion on implicit attitudes toward alcohol. Limitations and future directions are discussed.

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CHAPTER 1

INTRODUCTION

Despite increased awareness of complications, the use and abuse of alcohol remains a problem in the United States. In 2012, 17.7 million Americans were dependent on alcohol or had other problems related to alcohol use, such as neurological deficits, cardiovascular problems, various cancers, and liver diseases (U.S. Department of Health and Human Services; HHS, 2013c). Although abuse of alcohol has repercussions for the individual, the effects go beyond the personal level. With regard to the economic impact, drunk driving alone costs the United States an estimated 199 billion dollars annually (Blincoe, Miller, Zaloshnja, & Lawrence, 2014). Public safety is also impacted, with 4,856,510 victims of violent crimes reporting their offenders to be under the influence of alcohol (Alcohol and Crime, 2010).

Identifying and treating individuals with alcohol-related problems has the potential to increase safety of American citizens and decrease the amount of economic spending related to excessive alcohol consumption. Before successful interventions can be created and implemented, the underlying processes that lead to substance use must be better understood (Ostafin, Marlatt, & Greenwald, 2008). Pertaining to drinking, individuals encounter situations in which they must maintain a balance between the temptation to drink and the need to regulate alcohol intake for various reasons (Muraven, Collins, & Nienhaus, 2002). Situations such as these, which involve a conflict between goals, require the use of self-control (Muraven et al., 2002). For this reason, self-control, or lack thereof, which is also referred to as ego depletion, has been implicated as a potential cause of excessive alcohol consumption (Muraven, Collins, Shiffman, & Paty, 2005).

Alcohol Use in the College Population

Alcohol use among adults is a problem that should not be overlooked; however, underage drinking, particularly on college campuses, warrants current focus due to damaging long-term consequences (e.g., brain damage, liver disease, weakened heart muscles) and the opportunity for early intervention. The majority of underage alcohol consumption occurs within social contexts that encourage unhealthy drinking behaviors, such as heavy consumption and binge drinking (Clapp, Shillington, & Segars, 2000; HHS, 2013a). The National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines binge drinking as "a pattern of drinking that brings blood alcohol concentration (BAC) levels to 0.08 (this usually occurs after 4 drinks for women and 5 drinks for men) in about 2 hours" (HHS, 2013b). Research suggests that drinking practices are influenced by the college environment (Hingson, Heeren, Zokocs, Kopstein, & Wechsler, 2002; Kuo, Wechsler, Greenberg, & Lee, 2003), with rates of college student drinking exceeding that of their same-age peers who do not attend college (Johnston, O'Malley, Bachman, & Schulenberg, 2012).

Examination of underage drinking, such as on college campuses, provides valuable information and opportunity for early intervention. Addiction researchers have proposed the dual-process model as a way to understand how casual substance use can evolve into addiction over time (Ostafin et al., 2008). This model proposes that alcohol consumption is the result of both automatic alcohol-related processing biases and controlled processes. Whereas automatic processes are unintentional, effortless, and difficult to control, controlled processes are intentional, controllable, and occur within awareness. With continued use, substance use behaviors move from the realm of controlled processes to a function of automatic processes. After behaviors operate on an automatic level, the simple presence of a substance cue may

unintentionally activate positive expectancies about the substance and the behavioral tendency to approach and use the substance (Ostafin et al., 2008; Palfai & Wood, 2001). In other words, use becomes the norm over time, requiring less conscious direction.

Although various definitions of alcohol-related expectancies exist, Goldman, Del Boca, and Darkes (1999) described them as stored "information templates" found within the nervous system of individuals (Jajodia & Earleywine, 2003). Processing this stored information results in output of behavior; the memory templates of past experiences guide and influence future behavior. In regard to alcohol, expectancies result from the learned relationship between alcohol cues, drinking behavior, and the resultant outcomes (Jajodia & Earleywine, 2003). Learning-based models of substance use propose that an appetitive motivational state, or desire to satisfy a bodily state, is activated in the presence of substance-related cues (Stewart, de Wit, & Eikelboom, 1984; Wise, 1988). The activation of this motivational state may guide the individual to obtain and consume substances. Whereas in the past such individuals were able to actively consider the rewards and consequences of substance use prior to making the decision to consume, once under the influence of automatic processes, less "mental algebra" (Ostafin et al., 2008) goes into making the decision.

Previous studies have shown alcohol use and abuse to be correlated with the strength of association of alcohol cues to memories of positive alcohol outcomes such as positive thoughts about the future, positive views of the self, and feeling more extroverted (Jajodia & Earleywine, 2003). When compared to neutral cues, Palfai and Ostafin (2003) showed that alcohol cues produce stronger urges to drink alcohol as measured by an alcohol-approach Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). The IAT is a measure of implicit attitudes toward alcohol assessed by evaluating the difference between reaction times toward alcohol and

reaction times toward the control condition, non alcohol (e.g., water, soda) as a comparison; the higher the score, the stronger the urge to drink. This was found in both alcohol dependent and non-alcohol dependent individuals.

Measuring Attitudes with Implicit Versus Explicit Measures

It is important to take into account the potential underlying causes of substance use and addiction when choosing measures for scientific study. Previous studies have often relied mainly on either implicit computer-based tasks (Jajodia & Earleywine, 2003; Ostafin et al., 2008; Palfai & Ostafin, 2003) or explicit self-report measures such as electronic diaries and bogus taste tests (Christiansen, Cole, & Field, 2012; Muraven et al., 2002; Muraven et al., 2005). However, the dual-process model highlights the importance of using both types of measures. Previous findings have shown that different aspects of behavior may be predicted by implicit and explicit measures (Wiers, van Woerden, Smulders, & de Jong, 2002): Cognitions which are more easily controlled (e.g., expectancies) are better predicted by explicit measures, and less easily controlled cognitions (e.g., biases, prejudices) are better predicted by implicit measures (Dovidio, Kawakami, & Gaertner, 2002; Fazio, Jackson, Dunton, & Williams, 1995). The development of addictive behaviors may be influenced by both implicit and explicit cognitions but in different ways (Ostafin et al., 2008). Additionally, methods assessing implicit associations have been shown to be more resistant to self-presentational concerns and may reveal attitudes and associations even when individuals prefer not to express them (Greenwald, McGhee, & Schwartz, 1998).

One way implicit attitudes can be measured is through the use of the IAT. Research shows that implicit attitudes are automatically activated evaluations and actions outside the performer's conscious awareness (Greenwald et al., 1998). The alcohol-motivation version of

the IAT seeks to determine an individual's motivation toward (or desire to approach) alcohol by measuring the underlying strength of associations between concepts (i.e., alcohol-related pictures and approach words versus non-alcohol pictures and avoid words) in a reaction-time computer task (Greenwald et al., 1998; Wiers et al., 2000). Previous studies that employed the alcohol IAT used words (e.g., brew) to represent the alcohol category (e.g., Palfai & Ostafin, 2003). However, research suggests that stimuli which more closely resemble real-life drinking situations (i.e., pictures) may more successfully elicit motivation.

The use of an IAT containing evaluative categories such as 'good' and 'bad' can be found throughout substance use and abuse literature. To be consistent with learning-based models of substance use, Palfai and Ostafin (2003) replaced these evaluative categories with action tendency (behavioral) categories. These categories, containing words related to approach and avoidance behaviors, are meant to assess the strength of alcohol and behavioral associations in memory. Use of the alcohol motivation IAT, in particular, has warranted support with Lindgren et al. (2013) finding that alcohol-approach scores significantly predicted unique variance in drinks consumed per week.

The IAT has been successful in predicting alcohol use, and its use in research has shed light on implicit alcohol motivations. Jajodia and Earleywine (2003) used the IAT to successfully predict alcohol use among undergraduate students. Further research has shown that the IAT either predicted or was associated with quantity of drinking per occasion, higher frequency of binge drinking, more difficulty controlling alcohol use, stronger sensitivity to reward, and stronger positive expected outcomes (Palfai & Ostafin, 2003; Palfai & Wood, 2001).

The Effects of Ego Depletion on Decision Making Behaviors

Regulating alcohol consumption requires the use of self-control. Self-control has been defined as the conscious and effortful ability to overlook and override automatic or innate urges, emotions, and behaviors in order to maintain goal-directed behavior so that future goals can be met (Baumeister, Vohs, & Tice, 2007; Christiansen et al., 2012; Hagger, Wood, Stiff, & Chatzisarantis, 2010; Muraven et al., 2002; Muraven, Shmueli, & Burkley, 2006). Although the ability to curb current desires to obtain desirable future outcomes is adaptive (Hagger et al., 2010), many behavioral and social problems are linked to lapses in self-control (e.g., sexual impulsivity, crime and violence, overspending, overeating, alcohol and drug abuse). Due to the ability of self-control to impact everyday life across many different domains, we must conduct research to gain a better understanding of how self-control is diminished and what, if anything, can be done to combat its depletion.

The Strength Model of Self-Control (Baumeister et al., 2007) posits that self-control draws on a limited resource and affects subsequent acts that require the use of self-control. Much like a muscle becomes tired with repeated use, self-control resource becomes depleted (e.g., Baumeister et al., 2007). According to this model, resisting temptation leads an individual to give up more quickly when faced with a frustrating or difficult task at a later point in the day (Baumeister, Bratslavsky, Muraven, & Tice, 1998). The term “ego depletion” is used to refer to a temporary reduction in individuals’ ability to control themselves, their environment, or make decisions due to prior use of self-control resources (Baumeister et al., 1998; Baumeister et al., 2007).

Performance on subsequent tasks suffers even when the tasks are in different behavioral domains, but poor performance is limited to tasks requiring the use of self-control resources

(Christiansen et al., 2012; Muraven et al., 2006). Even if the task is difficult, subsequent performance will not suffer if previous tasks do not require the use of self-control (Muraven et al., 2002). When studying the idea of self-control, behavior has often been distinguished by whether automatic or controlled processes guide the behavior. In 1990, Fazio proposed that behavior is influenced by automatically activated attitudes unless an individual is motivated and able to control the behavior deliberately. This provides support for the idea that ego depletion allows automatic processes to more easily guide behavior (Christiansen et al., 2012).

In a research setting, ego depletion is often induced by using a dual-task paradigm. Participants are randomly assigned to either the ego-depletion condition or the control condition. Participants in the ego-depletion condition are given two consecutive tasks that require self-control, while participants in the control condition are given two consecutive tasks, but only the second task requires self-control (e.g., Hagger et al., 2010). This paradigm presumes that performance on the second task will be worse for participants in the ego-depletion condition compared to the control condition because the first task also requires self-control, thus depleting the limited resource.

The Effects of Ego Depletion on Alcohol Use

Although the body of literature is relatively small, several researchers have studied the potential effects of ego depletion on alcohol consumption (Christiansen et al., 2012; Muraven et al., 2002; Muraven et al., 2005; Ostafin et al., 2008). Many of the current studies gauge alcohol consumption via a bogus taste test: Participants hear a cover story to avoid revealing the true intentions of the study and then consume alcohol within the laboratory setting. For example, Muraven et al. (2002) used a well-known strategy to induce ego depletion prior to the bogus taste test. Participants in the ego-depletion condition were instructed to suppress the thought of a

white bear, while participants in the control condition solved arithmetic problems. A Taste Rating Task (TRT) was then used to measure alcohol intake. Participants were given a pitcher each of two different brands of beer and two glasses. They were then instructed to read adjectives (e.g., sweet, bitter) on the screen, sip as much or as little beer as they wanted, and then rate the extent to which the beer fit the adjective on the screen. Additionally, motivation to refrain from drinking was increased by telling participants that following the bogus taste test, they would have to take a driving simulator test, and depending on how well they drove, they could win a prize. Participants in the ego-depletion condition consumed more beer and reached higher Blood Alcohol Content (BAC) than participants in the control condition (Muraven et al., 2002). This particular study provided support for the strength model of self-control and opened the door to future research on ego depletion and alcohol consumption.

Although Christiansen et al. (2012) used slightly different ego-depletion procedures their results replicated the findings of Muraven et al. (2002). An emotion-suppression task in this study required participants to watch a film clip and suppress any emotions experienced during the duration of the film. Following completion of the depletion phase, participants took part in a bogus taste test in which they were given beers to taste and then rate. Similar to Muraven et al. (2002), this study attempted to increase motivation to refrain from drinking by telling participants there would be a subsequent reaction-time task, and good performance would lead to a monetary bonus. Once again, results showed that participants in the ego-depletion condition consumed more beer than those in the control condition, despite being presented with incentives to refrain from drinking (Christiansen et al., 2012).

These studies provide valuable data about the effects of ego depletion on alcohol consumption, but bogus taste tests are not always feasible. For example, individuals in treatment

for alcohol abuse or participants in research studies who are underage cannot be provided with alcohol. Having knowledge of the underlying processes that lead to alcohol consumption, despite motivations and intentions to refrain, allow for better prediction of substance use in high-risk situations (Ostafin et al., 2008). It is important for researchers to be able to study the effects of ego depletion on alcohol consumption in all classifications of drinkers, from social drinkers to alcohol-dependent individuals. Furthermore, unlike more stable traits, there seems to be potential for improvement of self-control with the help of psychological interventions (Baumeister et al., 2007).

The current study used both implicit and explicit measures of alcohol motivation in hopes of better understanding the effect of ego depletion on alcohol-related cognitions. The study sought to learn if alcohol-related cognitions were affected by ego depletion and if potential effects could be gauged using an implicit task of motivation toward alcohol, as opposed to a bogus taste test. It was hypothesized that positive perceptions of alcohol would be stronger in individuals experiencing ego depletion. Further, it was suspected that the effects might be influenced by participants' frequency of alcohol use and the extent to which alcohol is used as a coping mechanism for dealing with negative emotion.

CHAPTER 2

METHOD

Participants

One hundred and fifty undergraduate participants were recruited using SONA, Georgia Southern University's web-based experiment management system. Participants were given class credit for their participation in the study (alternate options were also available). Participants of all genders, races, ethnicities, and class ranks were allowed to participate. However, participants were required to be at least 18 years old to participate and had to endorse consumption of alcohol for their data to be included in analyses. Thirty-five participants were excluded for reporting that they do not drink and 14 were removed due to missing data, leaving a final sample of 101 individuals (32 men, 69 women). Participants ranged in age from 18 to 26 years (M = 19.64, SD = 1.76) and were predominantly white (60.4%). Participants were randomly assigned to one of two conditions. Fifty-nine participants completed the ego-depletion task and 42 completed the no ego-depletion task. All procedures were approved by the Institutional Review Board (IRB), and all ethical and safety practice standards were followed.

Measures

The Self Assessment Manikin (SAM). The SAM (Bradley & Lang, 1994) is a non-verbal pictorial measure that assesses an individual's level of pleasure, arousal, and dominance. For the purpose of this study, only the pleasure and arousal portions of the measure were used. Each dimension of the SAM consists of five pictures ranging from a smiling, happy figure to a frowning, unhappy figure for the pleasure dimension and an excited, wide-eyed figure to a relaxed, sleepy figure for the arousal dimension. Participants selected one of the five pictures or spaces between the pictures, resulting in a 9-point rating scale for each dimension.

The SAM was selected over other measures of affect for use in this particular study due to its brevity and non-verbal characteristics. Although it is much shorter than the full-length Pleasure, Arousal, Dominance (PAD) Emotion Scales (Mehrabian & Russell, 1974), a widely used instrument which consists of 34 items in semantic differential format, the pleasure and arousal dimensions of the SAM show almost complete convergence with the PAD (*r*s =.97 & .94, respectively; Bradley & Lang, 1994). Furthermore, additional studies have found ratings on the SAM to covary with measures of physiological and behavioral systems (Greenwald, Cook, & Lang, 1989; Lang, Greenwald, Bradley, & Hamm, 1993). For example, as SAM ratings of pleasure decrease, heart rate slows, and skin conductance responses increase.

Alcohol Use Disorders Identification Test (AUDIT). The AUDIT (Saunders et al., 1993) was created using data collected in health- care facilities in six culturally diverse countries: Australia, Kenya, Bulgaria, Norway, Mexico, and the United States (Saunders et al., 1993). The measure was designed to screen for a variety of alcohol-related problems but focuses on current hazardous and harmful consumption by asking primarily about symptoms occurring within the last year as opposed to the lifetime (Allen, Maisto, & Connors, 1995). The screening instrument contains 10 items that assess three conceptual domains: hazardous alcohol use, dependence symptoms, and harmful alcohol use (Saunders et al., 1993). Each response has a score ranging from zero to four, and each response score is added to get the total score, which reflects an individual's risk level related to alcohol use. A score greater than eight indicates hazardous and harmful alcohol use.

During the original creation of the AUDIT, the authors found reliabilities ranging from .60 to .90 across the three subscales (Saunders et al., 1993). Additionally, they found that the AUDIT detected 92% of hazardous and harmful drinkers with a specificity of 94%. Specificity

refers to the extent to which false positives on a particular test are a possibility: 100% specificity means that there are no false positives and a positive test means that the disease is actually present. A review of the literature conducted by Reinert and Allen (2007) found a high degree of internal consistency across a broad range of samples and settings, with a median reliability coefficient of .83 (range = .75 to .97).

The AUDIT has also been shown to have acceptable convergent, discriminant, and construct validity. The AUDIT and Michigan Alcohol Screening Test (MAST), a 25-question alcohol-screening test developed for use in the general population, have a correlation of $r = .88$ for both men and women (Bohn, Babor, & Kranzler, 1995). Another study found scores on a scale measuring social desirability and scores on the AUDIT to be inversely related, $r = -.21$ to -.25, indicating that respondents answer in a candid manner (Hays, Merz, & Nicholas, 1995). Hays et al. also found that first-time intoxicated driving offenders scored lower than repeat offenders on the AUDIT and that estimated BAC (eBAC) at the time of the intoxicated driving arrest were correlated with AUDIT scores. An eBAC is calculated using information provided by the individual about the number of drinks consumed and the time interval of the drinking episode (Turner, Bauerle, & Shu, 2004).

Clements (1998) found that when compared to DSM-IV criteria, the AUDIT identified current alcohol-dependent students better than the CAGE, MAST, and Svanum Scale (all are widely used alcohol-screening questionnaires). Additionally, Kokotailo, Egan, Gangnon, Brown, Mundt, and Fleming (2004) found a Cronbach's Alpha for a college student sample to be 0.81, indicating that students responded to the AUDIT questions consistently. The AUDIT also showcased adequate internal consistency in the present study with a Cronbach's Alpha of .85. With regard to administration via computer, Butler, Chiauzzi, Bromberg, Budman, and Buono

(2003) found computer-assisted AUDIT administration as effective at identifying harmful and hazardous drinking as paper-and-pencil administration.

Drinking Motives Questionnaire-Revised (DMQ-R). The DMQ-R (Cooper, 1994) assesses the motivations individuals possess with regard to drinking. Motivational models of alcohol use assume that drinking behavior motivated by different needs constitutes distinct behaviors (Cooper, 1994). Cooper postulated that drinking motives could be characterized along two dimensions: valence (positive or negative) and source (internal or external). The crossing of these two dimensions leads to four classes of motives: internally generated, positive reinforcement motives; externally generated, positive reinforcement motives; internally generated, negative reinforcement motives; and externally generated, negative reinforcement motives.

The DMQ-R contains 20 items that reflect reasons why individuals may be motivated to drink alcohol. Participants rated on a five-point scale (almost never/never to almost always/ always) how frequently each of the reasons motivate them to consume alcohol. No items are reversed scored and the four subscale scores are calculated as the sum of respective items.

Cooper (1994) showed the DMQ-R has sound psychometric properties, with all items loading significantly on their hypothesized factors (values ranging from .42 to .87 with all $ps <$ .001). Additionally, a Goodness-of-Model-Fit test showed the four-factor model to be a better fit for the data than the one, two, or three-factor models [x^2 (164, N = 110) = 1,006.4, $p < .001$]. Furthermore, the four-factor model fits well across subgroups (male and female, black and white, less than 17.5 years of age, and greater than or equal to 17.5 years of age were tested by Cooper (1994) with all items loading significantly on their intended factors. In the current study, the DMQ-R showcased adequate internal consistency across all subscales with Cronbach's Alpha as

follows: .89 on the social subscale, .84 on the coping subscale, .85 on the enhancement subscale, and .86 on the conformity subscale.

Alcohol Expectancy Questionnaire, 3rd Edition (AEQ-3). Originally created by Brown, Goldman, Inn, and Anderson (1980) and improved upon over the years, the AEQ-3 assesses the alcohol-specific outcome expectancies individuals have. Outcome expectancies have been defined as the beliefs held by individuals regarding the effects of alcohol on behavior, moods, and emotions (Leigh, 1989). Previous research has shown expectancies to predict both non-problematic and problematic drinking in adults (Brown, Goldman, & Christiansen, 1985), alcohol-abuse status in adults (Cooper, Russell, & George, 1988), and adolescent drinking (Christiansen & Goldman, 1983; Christensen, Smith, Roehling, & Goldman, 1989).

The scale consists of 40 items that assess 8 different expectancies (global positive, social and physical pleasure, social expressiveness, sexual enhancement, power and aggression, tension reduction and relaxation, cognitive and physical impairment, and careless unconcern). Scales 1 through 6 represent positive outcome expectancies and scales 7 and 8 represent negative outcome expectancies. No items are reversed scored, and the 8 subscale scores are calculated as the sum of respective items. The AEQ-3 total score represents the extent to which an individual possesses less beliefs about the negative effects of alcohol (e.g., interpersonal problems, hangovers, legal trouble) and stronger beliefs about the positive effects of alcohol (e.g., pleasure, social aspects, sexual arousal).

The AEQ-3 (George, Frone, Cooper, Russell, Skinner, & Windle, 1995) demonstrates sound psychometric properties, with all items loading significantly on their hypothesized factors. Additionally, a Chi-Square Goodness-of-Fit test showed the new eight-factor structure to be superior to the previous model containing only six factors. The AEQ-3 also proved to be

invariant across race and gender, with the overall fit being the same for both men and women and for white and black participants. In the current study, the AEQ-3 showcased adequate internal consistency across all subscales with Cronbach's Alpha as follows: .79 on the global positive subscale, .77 on the social and physical pleasure subscale, .87 on the social expressiveness subscale, .85 on the social enhancement subscale, .85 on the power and aggression subscale, .70 on the tension reduction and relaxation subscale, .78 on the cognitive and physical impairment subscale, and .72 on the careless unconcern subscale.

The Implicit Association Test (IAT). The premise of the IAT (Greenwald, McGhee & Schwartz, 1998) is that concepts that are similar or connected in memory should more quickly elicit a single response than concepts that are less similar and less associated in memory (Houwer, 2002). For this study, the approach/avoid IAT was used in conjunction with alcohol and non- alcohol-related pictures. The IAT uses reaction time to assess implicit attitudes toward stimuli. In this study, we assessed individuals' propensity to approach or avoid alcoholic beverages.

The IAT is composed of two target concepts (i.e., 'alcoholic' versus 'non-alcoholic' beverages) and two categories of attribute words (i.e., 'approach' and 'avoid' words). A picture of one of the two target concepts appears on the screen, and approach or avoid words were located at either the top right or left-handed side of the screen. Individuals responded by pressing the corresponding key (i.e., 'e' or 'i') that represent the appropriate target or attribute word. Following practice trials that were meant to allow the individual time to learn the task, each attribute was paired with a target concept word in critical trials. First, individuals responded to the highly associated words with the same key. Then, the individuals responded to less associated concepts with the same key. Reaction times (RTs) were recorded for each response.

The task is dependent upon the assumption that RTs will be faster when strongly associated concepts are congruent (i.e., share the same key) and slower when weakly associated concepts share the same key (i.e., are incongruent) in critical trials (Ostafin et al., 2008; Wiers et al., 2002).

During the original creation of the IAT, Greenwald et al. (1998) found the IAT to have excellent convergent validity. Expected correlations were found between IAT measures and common views regarding evaluations of semantic categories (e.g., weapons versus musical instruments). Additionally, this study provided support for the ability of the IAT to measure implicit attitudes that may not be easily detected using explicit self-report measures due to social desirability bias. Particularly, white participants in the study were shown to harbor implicit attitude preference for white over black individuals. This was shown in faster RTs when white names (i.e., those judged by an introductory psychology class to be more likely to belong to white Americans than black Americans) were paired with pleasant words than when black names (i.e., those judged by an introductory psychology class to be more likely to belong to black Americans than white Americans) were paired with pleasant words.

In 2001, Greenwald and Nosek reviewed the literature on the IAT in an attempt to reassess the reliability and validity of the IAT three years following its creation. The IAT possessed acceptable psychometric properties. Test-retest reliability averaged above $r = .60$ and internal consistency averaged greater than $\alpha = .80$. In the current study, the IAT possessed adequate test-retest reliability ($r = .51$) and adequate internal reliability ($\alpha = .86$).

Over the years, researchers have questioned the ability of participants to fake performance on the IAT. In response to these concerns, Banse, Seise, and Zerbes (2001) conducted a study in which they asked heterosexual participants to fake extremely positive

attitudes towards homosexuality. Results revealed that the IAT scores of individuals asked to fake showed an equally negative bias towards homosexuality as IAT scores of participants in the control condition. Additionally, Kim and Greenwald (1998) conducted a study in which participants were told the logic behind the IAT prior to administering the test. Interestingly, even though participants knew how the test worked, they were still not able to fake attitudes. These results show that even if participants are able to determine the purpose of the test, they will not likely be successful in changing the outcome.

Ego Depletion Task. In order to induce ego depletion, a task that has been previously shown in the literature to be successful was used (e.g., Baumeister et al., 1998; Dewall, Baumeister, Gailliot, & Maner, 2008). Participants were shown a paragraph of text and were instructed to cross out (by clicking a computer mouse) each occurrence of the letter 'e'. This task was repeated a total of four times with two different bodies of text. On the second and fourth administration of the task, participants in the ego-depletion condition were asked to cross out each occurrence of the letter 'e' *except* if the letter was followed by a vowel or if the letter was embedded in a word in which a vowel appeared two letters earlier or later. Participants in the non ego-depletion condition were instructed to simply cross out all occurrences of the letter 'e' throughout the four presentations of text.

Procedure

One or two participants were scheduled for each test session. Upon arrival at the lab, participants were seated at a computer surrounded by cardboard barriers to ensure privacy. Participants were asked to read and sign the Informed Consent document. Although participants were only identified by a random number, and names and data remained separate, they were given the option to not sign the form should they feel uncomfortable doing so.

Participants asked any questions they had and then were given their unique participant ID. This code was used for the duration of the experiment. All measures and manipulations were programmed using Inquisit and MediaLab software. Once started, MediaLab guided the participant through the remainder of the experiment.

Following an instruction screen welcoming the participant to the study and reminding them to read instructions carefully, the SAM was presented first to establish baseline affect. Following completion of SAM ratings, participants were presented with the IAT to establish a baseline measure of implicit motivations toward alcohol use. Following completion of the first IAT, the participant encountered the manipulation phase of the experiment. The study manipulation consisted of an ego-depletion condition and a control condition. Following completion of the ego-depletion or no ego-depletion task, participants once again completed the SAM and the IAT. The tasks were presented in exactly the same manner as they were when administered at baseline, but this time the outcome is meant to showcase the effect of ego depletion (or lack of) on affect and alcohol motivations.

Following completion of the second IAT, participants completed a battery of questionnaires, which was comprised of the AUDIT, the DMQ-R, the AEQ-3 and several demographic questions. The AUDIT, DMQ-R, and AEQ-3 were presented to participants in random order. The last task was a brief demographic questionnaire, which included questions about age, race, sex, and a question asking them to indicate whether or not they consume alcohol.

CHAPTER 3

RESULTS

Group Differences

Several t-tests were conducted to determine whether the ego-depletion and no ego-depletion groups were equivalent on variables that could influence the findings of the study, such as overall alcohol motivation as measured by the IAT and drinking problems as measured by the AUDIT. Of note, based on average AUDIT scores across groups, the current sample can be classified as problem drinkers (M = 8.57, SD = 6.34). Further analysis indicated the two groups were not significantly different in regard to motivation to consume alcohol (pretest alcohol-approach IAT scores), $t(99) = -.508$, $p = .613$, or problematic drinking behavior (AUDIT scores), $t(99) = .639$, $p = .524$.

Manipulation Check

A paired-samples t-test compared the mean pleasure ratings for the ego-depletion group. A significant difference was found from pretest (M = 3.00, SD = 1.07) to posttest (M = 4.56, SD = 1.38), $t(58) = -8.11$, $p < .001$. A second paired-samples t-test compared the mean arousal ratings for the ego-depletion group. A significant difference was found from pretest (M = 4.86, SD = 1.68) and posttest (M = 6.14, SD = 1.86), $t(58) = -5.64$, $p < .001$.

A paired-samples t-test was conducted to compare the mean pleasure ratings for the no ego-depletion group. A significant difference was found from pretest (M = 3.24, SD = 1.62) and posttest (M = 5.07, SD = 1.50), $t(41) = -7.85$, $p < .001$. A second paired-samples t-test compared the mean arousal ratings for the no ego-depletion group. A significant difference was found from pretest (M = 5.67, SD = 2.25) and posttest (M = 6.52, SD = 1.93), $t(41) = -2.95$, $p = .005$.

Participants reported being more aroused and experiencing more pleasure following the manipulation and control tasks (see Figure 1).

Effect of Ego Depletion on Implicit Motivation Toward Alcohol

It was hypothesized that the ego-depletion alcohol-motivation relationship would be affected by the participants' frequency of alcohol use and the extent to which alcohol was used as a coping mechanism. A correlational analysis was conducted between the pretest IAT score and all other continuous variables. See Table 1 for descriptive statistics for the continuous variables and Table 2 for correlations. However, the correlational analysis revealed that enhancement-related drinking motives (DMQ-R Enhancement subscale score), social drinking motives (DMQ-R Social subscale score), alcohol expectancies (AEQ total score), and problem drinking (AUDIT total score) had stronger relationship with alcohol-approach scores in the current study (see Figure 2-5). For this reason, they were used as covariates.

A 2 (condition) x 2 (pre- and post-test IAT score) ANCOVA was conducted to compare the effect of ego depletion on IAT scores (alcohol-approach motivation) in ego-depletion and no ego-depletion conditions. No significant effect of condition on alcohol motivations after controlling for the effect of enhancement motives, social motives, alcohol expectancies, and problem drinking was found, $F(1,95) = .22$, $p = .640$. See figure 6.

CHAPTER 4

DISCUSSION

The purpose of the current study was to examine the effect of ego depletion on alcohol – related motivations. Whereas previous studies have used explicit measures to gauge this effect (i.e., bogus taste tests), the current study used an implicit measure (i.e., the IAT). It was hypothesized that positive perceptions of alcohol would be stronger following ego depletion. The results of the study did not support the hypotheses, revealing no significant difference between IAT scores for participants in the ego depletion and no ego-depletion conditions.

Additionally, it was hypothesized that the ego-depletion alcohol-motivation relationship would be affected by the participants' frequency of alcohol use and the extent to which alcohol was used as a coping mechanism. However, a correlational analysis revealed that enhancement-related drinking motives (DMQ-R Enhancement subscale score), social drinking motives (DMQ-R Social subscale score), alcohol expectancies (AEQ total score), and problem drinking (AUDIT total score) had a greater impact on changes in alcohol-approach scores in the current study. For this reason, these measures were analyzed as potential covariates.

Several studies examining the relationship between ego depletion and alcohol consumption provide insight into current non-significant findings. A primary difference may be in the type of task chosen in the current study compared to other designs. For instance, in one of those studies, a thought-suppression task was followed by a bogus taste test (Muraven et al., 2002). Participants in the ego-depletion condition consumed more beer and reached higher BACs than those participants in the control condition who solved math problems instead. Ostafin, Marlatt, and Greenwald (2008) ego depleted participants by having them suppress negative affect and thoughts of aversive slides viewed previously, followed by completion of an

alcohol taste test. Once again, participants in the ego-depletion condition consumed more alcohol than participants in the no ego-depletion condition. An important commonality between these studies may account for the discrepancy of results in the current study; that is, both studies used cover stories to motivate the participants to restrain their drinking.

Restrained drinkers have been described as those who attempt to maintain a balance between their temptation to drink and their need to regulate alcohol intake. Drinking restraint involves a conflict between goals (i.e., "I want this drink" versus "I have to drive home tonight") and thus requires the use of self-control (Muraven, Collins, & Nienhaus, 2002). The Drinking-Restraint Model theorizes that drinking occurs within a context in which an individual alternates between being attracted to alcohol and needing to regulate alcohol intake for a variety of reasons (Collins, Koutsky, Morsheimer, & MacLean, 2001). Excessive drinking, according to this model, occurs due to the cycle of attraction to alcohol and the inability to successfully restrict intake. The ability to successfully restrict alcohol intake is dependent upon the availability of self-control resources. Ego depletion has been described to only affect tasks that require the use of self-control and has no effect on tasks that do not require self-control. Therefore, unrestrained drinking, which does not require self-control, should not be affected by an individual's level of self-control resources.

In the previous studies, motivation to restrain was induced in two different manners. Muraven, Collins, and Nienhaus (2002) told participants that after the taste test they would take a driving simulator test, and if they performed well enough they could potentially win a prize. Ostafin, Marlatt, and Greenwald (2008) informed participants that after the taste test they would participate in a reaction-time task and that drinking could slow down their reaction time. Once again, participants were told that if they performed well enough they could win a prize. The

current study did not require or motivate participants to restrain in any way. This lack of motivation to restrain may be the missing piece that accounts for the lack of significant difference between IAT scores before and after ego depletion.

Along with outcome expectancies and individual and environmental factors, among others, drinking motives have long been considered to predict an individual's alcohol consumption. Drinking motives are specific and proximal reasons for drinking (Cooper, 1994). These motives include social (e.g., drinking makes social gatherings more fun), coping (e.g., drinking to forget about your problems), enhancement (e.g., drinking because it is exciting), and conformity (e.g., consuming alcohol because your friends pressure you to drink). In the current study, the majority of participants were enhancement or socially-motivated drinkers. Therefore, it is quite possible that these motives for drinking do not align with the concept of ego depletion; that is, instead of consuming alcohol to cope (with ego depletion, for example), these participants are consuming alcohol for social-and enhancement-related reasons. It is possible that ego depletion affects individuals differently depending upon their motives to consume alcohol.

Limitations

There are several limitations present in the current study. First, a large portion of the study relied upon self-report measures of frequency of use and motivations behind the use of alcohol. Self-report measures can be prone to social-desirability bias, thus is it possible that participants misrepresented their frequency of alcohol use. Second, the use of a college-age sample serves as a limitation. Although a college-age sample was justified in the current study, use of the sample serves as a barrier to external validity by not allowing generalization to other populations, such as adolescents, same-aged non-college attending peers, and older adults. Additionally, the observed power in the current study was low (.19). It is possible that the

sample was not large enough to detect any potential differences between groups. Third, the current study employed the use of a computerized ego-depletion task. Previous studies have used similar tasks but administered them via paper-and-pencil. It is possible that the use of a computerized task had unaccounted for effects on participants. Research assistants noted hearing participants sigh and appear frustrated while completing the task. Perhaps having to click with a mouse elicited more frustration than simply crossing out letters on a piece of paper. Additionally, the selected ego-depletion task may not have elicited the type of motivation to restrain necessary to gauge the effects of ego depletion on alcohol motivations via an implicit measure.

In light of the limitations in the current study, the study also boasts a notable strength. This study serves as the first to attempt to gauge the effects of ego depletion on alcohol motivations via an implicit measure. Although the study leaves questions unanswered, it provides guidance for future studies in this area.

Future Directions

The current study was the first to attempt to use an implicit measure to examine the effect of ego depletion on alcohol motivation. For this reason, questions remain to be answered. Although the current study did not find support for the use of an implicit measure of alcohol motivation, is it possible that such a measure is a viable option under certain circumstances. Future studies should seek to understand the circumstances under which an implicit measure is viable and how to best manipulate ego depletion for maximum effects. For example, future research may investigate the extent to which motivation to restrain influences a person's decision making while ego depleted and, if so, how might motivation to restrain be achieved without requiring participants to actually consume alcohol?

Prior to beginning the study, it was believed that a large majority of the sample would be coping-motivated drinkers. That is, they would score high on the coping scale of the DMQ-R. However, the majority of the sample scored high on the Social and Enhancement scales and low on the Coping scale. This leaves an unresolved question regarding the role of self-reported reasons for drinking on a person's experience of ego depletion and their desire to consume alcohol subsequent of being depleted. Perhaps ego depletion affects drinkers differently depending on the motivation behind alcohol consumption. Future studies should seek to answer these questions.

The current study used a popular ego-depletion task typically administered with the paper-and-pencil method but instead administered it via computer. It is unclear in the current study whether or not the computerized task had the intended effects. For this reason, future studies should test the computerized ego-depletion task to provide support for using this measure via computer.

Conclusion

The current study is the first of its kind. While previous studies have examined the effect of ego depletion on alcohol consumption via explicit measures, mainly the bogus taste test, this was the first to include a measure of implicit alcohol-related cognition. The goal of the current study was to learn if automatic alcohol-related cognitions are affected by ego depletion and if potential effects can be gauged using an implicit task of motivation toward alcohol. The results revealed no significant difference in mean IAT scores between the conditions, thus failing to provide support for our hypotheses. It is theorized that when gauging effects of ego depletion on alcohol consumption, motivation to restrain (or not approach alcohol) is an important piece of

the puzzle that was missing in the current study. Continuing this research is important to understanding alcohol-related problems and factors that may threaten treatment and recovery.

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Table 1.

Descriptive statistics for outcome variables.

	No Ego Depletion	Ego Depletion
Variables	M (SD)	M (SD)
Pretest IAT Score	.25 (.46)	.21 (.47)
Posttest IAT Score	.13 (.42)	.16 (.40)
SAM Pleasure Rating		
Pretest	3.24 (1.62)	3.00 (1.07)
Posttest	5.07 (1.50)	4.56 (1.38)
SAM Arousal Rating		
Pretest	5.67 (2.25)	4.86 (1.68)
Posttest	6.52 (1.93)	6.14 (1.86)
DMQ-R Social	15.59 (4.78)	16.03 (5.15)
DMQ-R Coping	10.05 (4.68)	10.51 (4.54)
DMQ-R Enhancement	12.88 (4.42)	13.83 (4.96)
DMQ-R Conformity	7.50 (3.69)	8.27 (3.65)
Alcohol Expectancies	148.33 (32.24)	146.98 (29.29)
AUDIT Total	8.09 (6.01)	8.92 (6.59)

Table 2. Pearson's r correlations

		2	3	4	5	6	7	8	9	10	11
1	Pretest IAT Score	-.046	.088	.116	.033	.325**	.126	.408**	-.029	.268**	.202*
2	Pretest SAM Pleasure Rating		.424**	.458**	.260**	-.124	-.088	-.170	-.110	-.018	-.108
3	Posttest SAM Pleasure Rating			.294**	.431**	.066	.133	.063	.103	.088	.042
4	Pretest SAM Arousal Rating				.566**	-.075	-.176	-.193	-.198*	-.099	-.216*
5	Posttest SAM Arousal Rating					-.004	-.093	-.092	-.009	.021	-.211*
6	DMQ-R Social						.525**	.741**	.344**	.532**	.429**
7	DMQ-R Coping							.513	.364**	.622**	.543**
8	DMQ-R Enhancement								.383**	.570**	.536**
9	DMQ-R Conformity									.509**	.349**
10	Alcohol Expectancies										.546**
11	AUDIT Total										

* Significant at $p \leq .05$
** Significant at $p \leq .01$

Figure 1. Change in Mean SAM Pleasure and Arousal ratings from pretest to posttest for the ego-depletion and no ego-depletion groups.

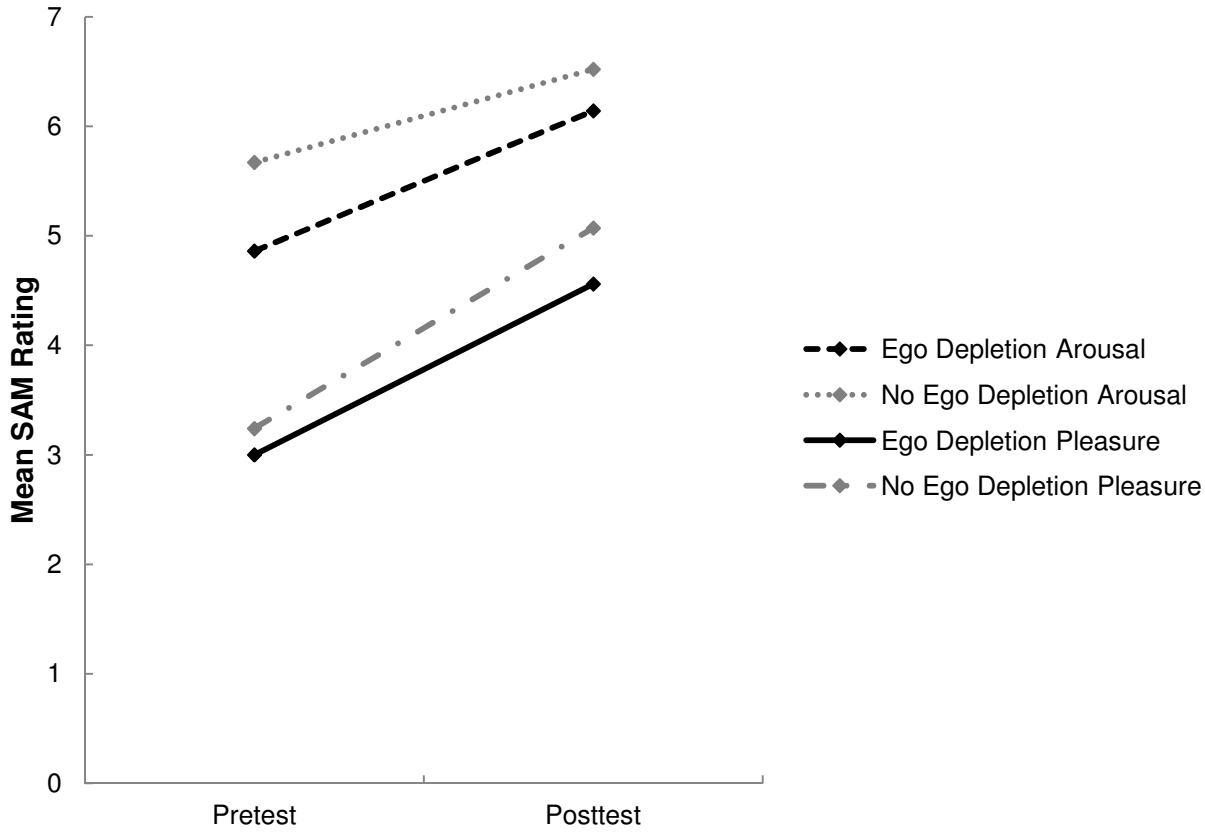

Figure 2. Correlation between pretest IAT score and enhancement drinking motives (DMQ-R enhancement subscale score).

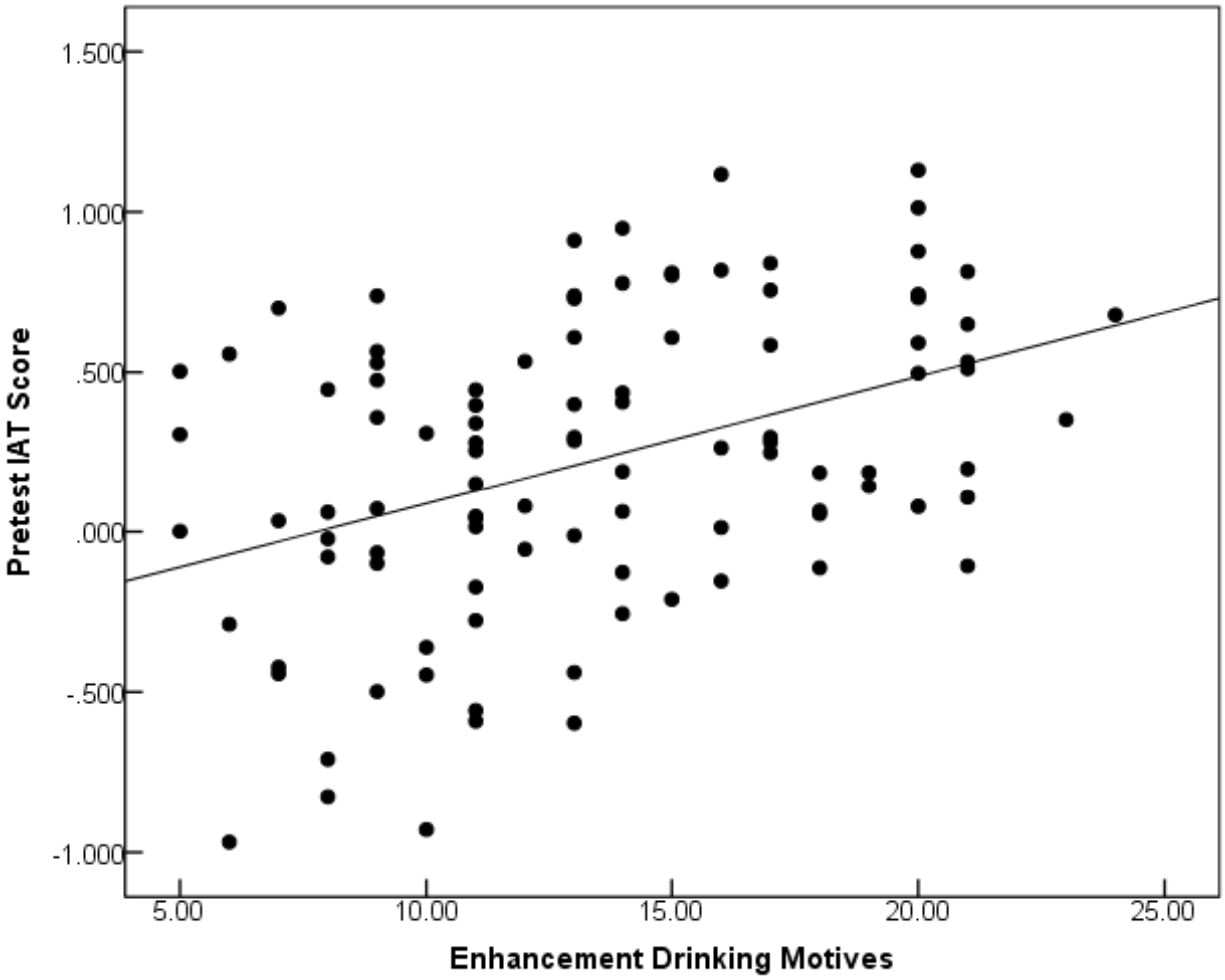

Figure 3. Correlation between pretest IAT score and social drinking motives (DMQ-R Social subscale score).

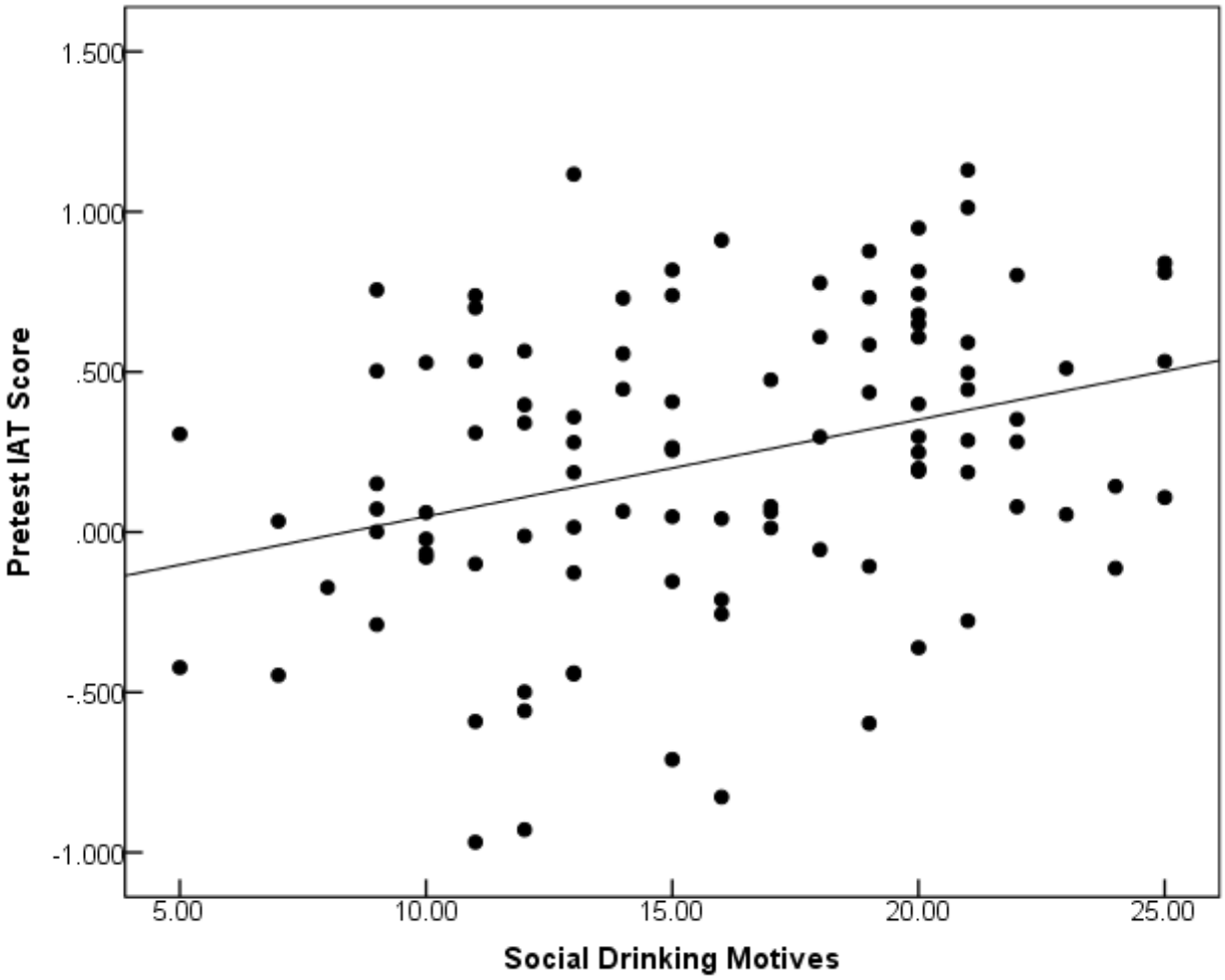

Figure 4. Correlation between pretest IAT score and alcohol expectancies (AEQ-3 total score).

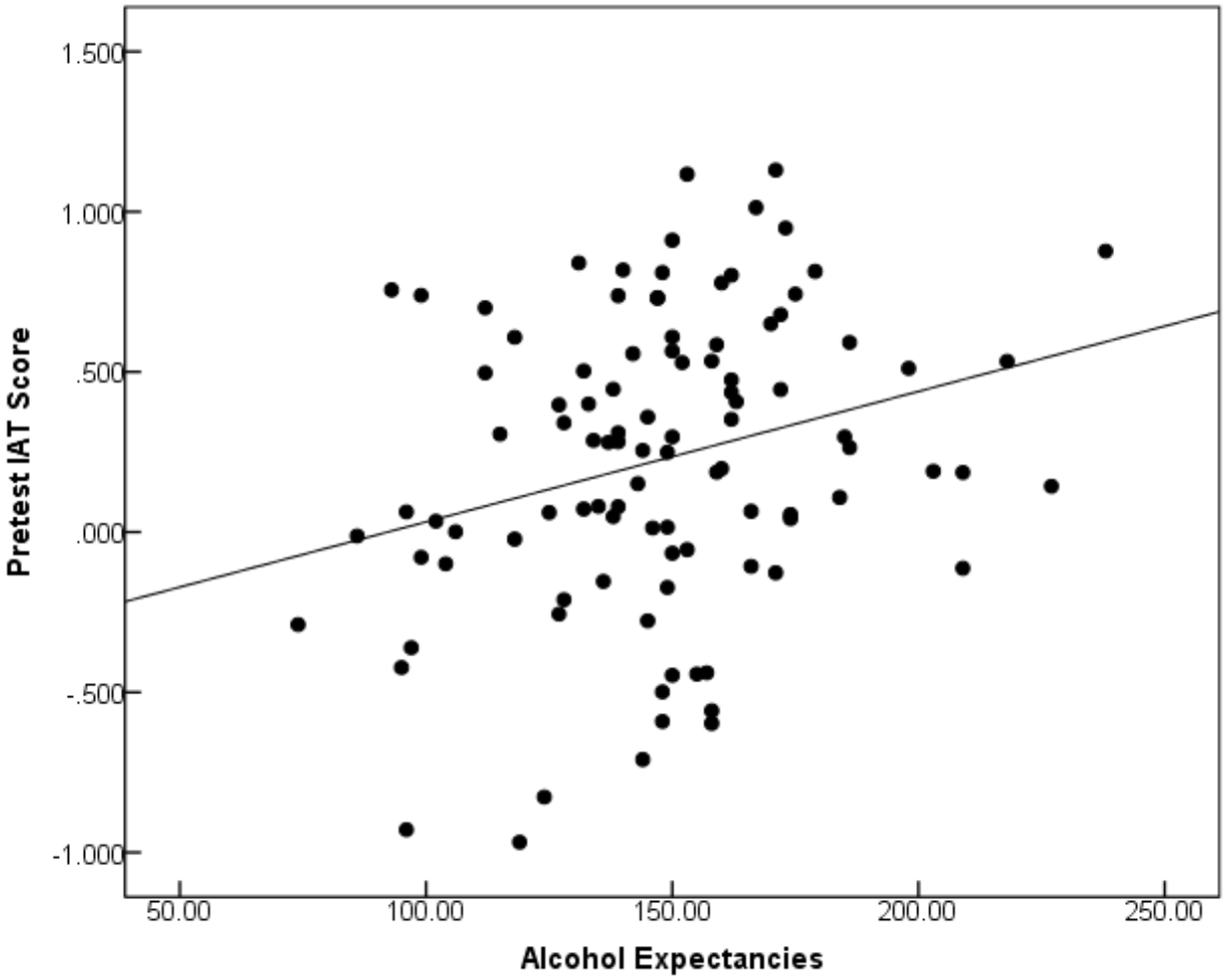

Figure 5. Correlation between pretest IAT score and problem drinking (AUDIT total score).

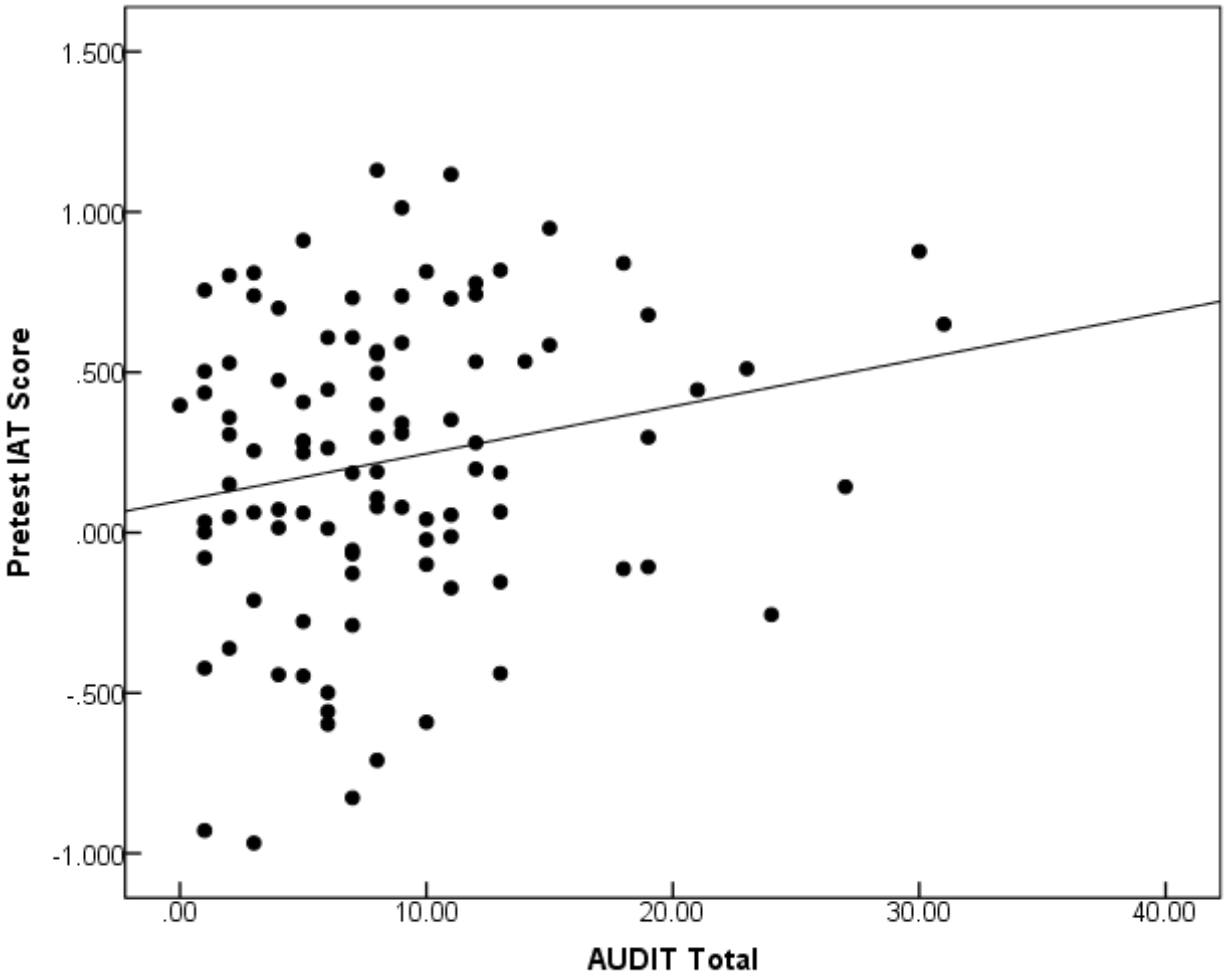

Figure 6. Bar graph of mean IAT scores at pretest and posttest for the ego-depletion and no ego-depletion groups.