Striving for Skinny

Exploring Weight Control as Motivation for Illicit Stimulant Use

by

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ABSTRACT

There is a growing trend among community samples of young, adult women to initiate drug use for weight loss (Boys, Marsden, & Strang, 2001; Mendieta-Tan, Hulbert-Williams, & Nicholls, 2013). Research has suggested that consequential weight loss may maintain drug use (Cohen, et al., 2010; Ersche, Stochl, Woodward, & Fletcher, 2013; Sirles, 2002), which is compounded by women's perception that drugs are convenient and guarantee weight loss (Mendieta-Tan, et al., 2013). Stimulants, including cocaine, amphetamine, methamphetamine, and ecstasy, are notable drugs of use among college students (Johnston, et al., 2014; Teter, McCabe, LaGrange, Cranford, & Boyd, 2006). With known appetitive and metabolic effects, stimulants may be particularly attractive to college women, who are at elevated risk for increased body dissatisfaction and experimenting with extreme weight loss techniques (Grunewald, 1985; National Eating Disorder Association, 2013). A preliminary epidemiological study of 130 college women between 16- and 24-years old (M_{age} = 18.76, SDa_{ge} = 1.09) was conducted to begin to investigate this phenomenon. Results showed women who reported use for weight control (n = 19, 14.6 %) predominantly used stimulants (68.4%), and this subgroup was severely elevated on global and subscales of eating pathology compared with college norms. Moreover, the odds of stimulant use were doubled when women engaged in a compensatory behavior, such as excessive exercise, self-induced vomiting, and laxative use. Although preliminary, these results suggest that a desire for weight control may be associated with stimulant use among college women. Women engaging in more extreme weight loss behaviors are at high risk for initiating and maintaining illicit stimulant use for weight-related reasons.

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Striving for Skinny:

Investigating Weight Control as Motivation for Stimulant Use

Despite prevention and intervention efforts across the United States, drug use continues to be a problem. In 2013, up to 50% of 12th graders have used illicit substances other than marijuana (Johnston et al., 2014). Prevalence of drug use peaks at 21-years of age with 41% report engaging in annual use and 11% using currently (Johnston et al., 2010). The National Drug Intelligence Center (2011) estimated that substance use costs the United States $200 billion per year, which includes crime, health, and loss of productivity. Young adults ages 20-24 account for a substantial portion of these costs (The National Drug Intelligence Center, 2011). Drug use fosters crime within communities through illegal acts committed under intoxication or withdrawal and acts related to payment for drugs, such as obtaining money or stolen goods and bartering sex or labor (Caulkins, 2007; Caulkins & Reuter, 2006). On an individual level, drug abuse is associated with poorer physical and mental health (McGeary & French, 2000; Siegfried, 1998) as well as poorer job histories (Ellinwood, Smith, & Vaillant, 1966; Griffin, Weiss, Mirin, & Lange, 1989) and lower socioeconomic status (Griffin et al., 1989). Given the high prevalence of drug use among young adults and the severity of drug-use consequences, research is needed to target risk factors for substance use that are fundamental to prevention and intervention programs.

Changes in patterns of drug use in the United States since 1975 found several key conclusions that have implications for future prevention research (Johnston et al., 2014). Yet, secular trends seem to suggest a time lag for the use of new drugs, in which the benefits of a drug are spread while the consequences are not yet known. A similar

phenomenon occurs with older drugs, suggesting generational forgetfulness. After popularity of a specific drug falls, the new generation re-discovers the drug and seems unaware of its adverse consequences (Cox, Johnson, Meikle, Jamieson, & Posner, 2007; Hall & Degenhardt, 2009; Johnston et al., 2014). Patterns of use for heroin, cocaine, and phencyclidine (PCP) across time all exemplify generational forgetting (Johnston et al., 2014). In an examination of use across five national datasets, cocaine use was fairly stable throughout the 1980's before dropping in the mid-1990's and increasing again by the turn of the century (O'Malley & Johnston, 2002). As the amount of evidence needed to contain drug use is much larger than the evidence and testimonial required for benefits of drug use, these historical patterns of drug use highlight the need for continued research that reflect emergent trends and motives for use among new generations.

College as a Risk Period

Defined as the period between 18-years and 25-years of age, emerging adulthood coincides with college-attending years and is important for learning responsibility (Arnett, 2000). College is a unique environment that simultaneously stimulates belief and identity formation while removing parental supervision and responsibilities towards others (Arnett, 2000, 2005). Given that emerging adulthood is marked by high rates of illicit drug and alcohol use (Substance Abuse & Mental Health Services Administration [SAMHSA], 2008) as well as the highest rates of comorbidity between substance use and other psychological disorders (Chan, Dennis, & Funk, 2008; Goodman, Hendersen, Peterson-Badali, & Goldstein, 2015; SAMHSA, 2008), it seems attending college may increase risk for developing pathological rates of substance use during a vulnerable developmental period. Both the limited parental supervision and lack of responsibility

play an important role in escalating substance use (Arnett, 2000, 2005). For instance, research has shown that college-aged individuals who felt more responsibility were more likely to recognize when their substance use was problematic and to commit to change (Goodman et al., 2015; Wray-Lake et al., 2012).

The majority of research examining substance use among college students and their non-college peers has focused on alcohol consumption. Results from the National Epidemiological Survey on Alcohol and Related Conditions (NESARC) found that the two groups consume alcohol at similar rates (Chen et al., 2004) with comparable rates of alcohol abuse and dependence (Dawson, Grant, Stinson, & Chou, 2004), suggesting this increase in use is more due to a change in living situation and the transition to young adulthood than the specific experience of attending college (Arnett, 2005).

However, other studies have found college students to be a high-risk group for substance abuse. For instance, results from a study comparing five different national datasets (College Alcohol Study, The CORE Institute, Monitoring the Future, the National College Health Risk Behavior Survey, and the National Household Survey on Drug Abuse) found that although college-bound students typically drink less than their non-college-bound peers, college-attending students drink more and at a higher frequency, eventually surpassing their non-college-attending peers (O'Malley & Johnston, 2002). Living in a college dorm specifically has been shown to uniquely predict alcohol misuse among young adults (Barnes, Welte, & Dintcheff, 1992). Prevalence of high-risk drinking behaviors and rates of alcohol dependence were highest among on-campus college students, even when compared to non-college students living independently (Dawson et al., 2004). College women, irrespective of their living

arrangements, were more likely not only to engage in heavy episodic drinking but also to engage at a higher frequency as compared to non-college women (Dawson et al., 2004). The most convincing evidence of the increased risk of substance use with college attendance comes from a longitudinal twin study that found that binge drinking remained significantly associated with college attendance even after controlling for genetic, family history, demographic, and lifestyle factors (Slutske et al., 2004).

There is some evidence that suggests these trends may generalize to illicit drugs. Just as consumption and frequency of alcohol use was higher among college students, research has found that consumption of illicit stimulants was more prevalent among college students in contrast with non-college students (Herman-Stahl, Kebs, Kroutil, & Heller, 2007). However, similar findings have not been found for cigarettes, marijuana, and cocaine (O'Malley & Johnston, 2002). This may be due to the increased pressure to perform academically and the associated cognitive enhancements of stimulants (Bagot & Kaminer, 2014; Franke , Lieb, & Hildt, 2012; Ilieva & Farah, 2013). It is important to note that the majority of reviewed studies are cross-sectional, such as the five national epidemiological studies examined by O'Malley and Johnston (2002). Though epidemiological surveys provide important prevalence information, these studies rely on retrospective report and may be biased by telescoping effects, over- or underestimation of the amount of time that has elapsed since a given event (Janssen, Chessa, & Murre, 2006; Shillington, Woodruff, Clapp, Reed, & Lemus, 2012). Longitudinal, prospective designs have demonstrated that rates of substance use, in particular, are double than those estimated by cross-sectional studies using retrospective reports (Moffit et al., 2010).

One such study has suggested that illicit stimulant use is a current problem on college campuses. In a recent longitudinal, prospective study, Arria and colleagues (2013) found that cocaine and illicit use of prescribed stimulants were the most commonly reported drugs when controlling for marijuana. Nearly a third (30.6%) of college students who were classified as a low drug-using group and 92.6% of college students in a high drug-using group reported cocaine use (Arria et al., 2013). Both trajectory groups were significantly more likely to discontinue college enrollment than college students who minimally tried drugs or only used marijuana (Arria et al., 2013). Other studies have also associated drug use among college students with suicidal ideation, lower grade point averages, more skipped classes, physical altercations, risky driving and sex behaviors, and illegal activity (Lamis, Ballard, & Patel, 2014; Martens, Brown, Donovan, & Dude, 2005; Palmer, McMahon, Moreggi, Rounsaville, & Ball, 2012). Together, this suggests that though illicit drug use among college students does not mirror the distinct trajectories found for alcohol use, its use remains a problem on college campuses.

Prevalence and Demographics of Stimulant Use

Psychostimulants constitute a major portion of illicit drug use among college students**.** Notable psychostimulants used by college students are amphetamines, which include prescription (i.e., Adderall and Ritalin) and street derivatives (i.e., methamphetamine), cocaine, and 3-4-methylenedioxymethamphetamine (i.e., MDMA or "ecstasy"). The highest rate of annual and current use for these each of these stimulants occurs within college-attending years. According to the *Monitoring the Future* study among 18-55-year olds, the highest use for amphetamine (annual: 11%, current: 5%),

cocaine (annual: 5%, current: 2%), and ecstasy (annual: 6%, current: 1%) occurs between 21-22-years of age (Johnston et al., 2014). The majority of lifetime prescription stimulant users begin abusing stimulants in college (Teter, McCabe, LaGrange, Cranford, & Boyd, 2006). An estimated 11% of college students reported annual abuse of amphetamines, whereas 5% and 3% reported annual ecstasy and cocaine use, respectively (Johnston et al., 2014). Though the annual use of cocaine among college students may seem low, it is the only psychostimulant for which lifetime, annual, and current use rates increase with age (Johnston et al., 2014). Additionally, twelfth graders today perceive cocaine to be more available than in the last five years (Johnston et al., 2014), which may be predictive of a future rise in use as supported by the significant increase in cocaine use after high school (Williams, Pacula, Chaloupka, & Wechsler, 2006). This in combination with a growing drug market that provides more illicit substances at more affordable prices (Storti & de Grauwe, 2009) may be indicative of increased use in years to come. Thus, college is a critical period for intervention and prevention that can potentially impact those that develop into lifetime users.

There are numerous factors that have been theorized to predict the prevalence rates of drug use among college-aged individuals, with the one of the most prominent being behavioral economics of the drug market. Behavioral economics suggests that the larger global drug market has increased competition and decreased prices making drugs more accessible and available than ever before (Storti & de Grauwe, 2009). This has been particularly true for cocaine (Bretteville-Jensen, 2011; Goudie, Sumnall, Field, Clayton, & Cole, 2007; Storti & de Gauwe, 2009; Williams et al., 2006). Historically, cocaine was predominantly used by those of upper socioeconomic status, but more recent

research suggests that cocaine has become income and price inelastic among the general population (Bretteville-Jensen, 2011; Goudie et al., 2007), meaning that changes in income and price do not correlate with a change in demand. Alternatively, some literature suggests that stimulants, such as ecstasy and cocaine, are frequently substituted for one another as price fluctuates (Cole et al., 2008; Sumnall, Tyler, Wagstaff, & Cole, 2004). Prior to 1986, cocaine use was positively associated with socioeconomic level (McCrystal, Percy, & Higgins, 2007; Williams et al., 2006). This positive association has nearly disappeared with the advent of crack cocaine, which offered cocaine at a substantially lower price (Johnston et al., 2014). A more recent national survey found that the differences in drug use by socioeconomic class are very small, particularly among youth, and these trends have remained parallel since 1986 (Johnston et al., 2014). Due to increased availability and affordability of psychostimulants among youth today, research needs to address motivational factors for use across socioeconomic levels.

College women constitute an important subgroup of psychostimulant users. Though research indicates alcohol prevention programs have been tailored to target college women (Kelly-Weeder, 2008; LaBrie, et al., 2008; Musher-Eizenman & Kulick, 2003), illicit drug research and prevention programs neglect this important demographic. This is important since early adolescent girls endorse higher rates of illicit drug use, excluding marijuana, than boys (Johnston et al., 2014). Moreover, research has shown that girls become addicted to substances quicker and suffered consequences of drugs sooner compared with their male counterparts (National Center on Addiction & Substance Abuse, 2003; Wiechelt, 2008). This may be in part due to the propensity among early maturing women to begin using more dangerous illicit substances at an

younger age (Kosten, Gawin, Kosten, & Rounsaville, 1993), which is associated with more chronic problems (Griffin et al., 1989) and shorter periods of abstinence from such drugs (Kosten et al., 1993). Women, in particular, are more likely to abuse amphetamines than men (Teter et al., 2006). Similarly, women use cocaine at a greater frequency and severity than men (Kosten et al., 1993), which is associated with elevated risk of negative outcomes. Given the myriad of negative outcomes associated with and predicted by substance use, it is crucial to understand what motivates and increases risk of use among college women.

The prevalence and demographic literature emphasize that despite current prevention and intervention programs and mass media campaigns, drug use and its associated consequences persist. Past literature does not necessarily reflect current trends across developmental stages, generational effects, or even race and gender differences. It is crucial to understand the intricacies among subgroups in order to maximize the effectiveness of prevention and intervention programs and develop targeted preventive efforts.

Determinants of Drug Use among Girls and Women

Adolescents and young adults are motivated by an intense desire for positive arousal as behavioral and emotional regulation abilities are not fully developed (Casey, Tottenham, Liston, & Durston, 2005; Steinberg, 2008). Due to deficits in affective regulatory capabilities, adolescence is distinguished by extreme fluctuations in mood and intense emotional experiences (Colder, Chassin, Lee, & Villalta, 2010; Larson, Csikszentmihalyi, & Graef, 1980). Therefore, a desire for symptomatic relief of negative mood states and affect-enhancing effects may drive substance use (Sher, 1991; Wills &

Hirky, 1996; Wills & Shiffman, 1985). The negative affect model, originally proposed by Sher (1991), has been tested predominantly in relation to alcohol or cigarette use (refer to Figure 1). Because negative affect is commonly experienced across drug type, this pathway may extrapolate to determinants of harder drug use, such as amphetamine, methamphetamine, cocaine, and ecstasy. For instance, in a large community sample of women, negative affect significantly predicted substance use, particularly illicit drug use (VanZile-Tamsen, Testa, Harlow, & Livingston, 2006). There are numerous theories that aim to explain and predict substance use, yet this review focuses on the negative affect model due to its relevance to the current study.

Originally proposed as part of a larger integrative model to explain the pathway between family history and alcoholism, the negative affect model posits that liability to pathological use relates to negative affect, life stress, and ineffective coping strategies. Family history, which includes both the biological and heritable factors as well as psychosocial effects of having a parent who uses or abuses substances, has been theorized to influence the development of personality and temperament such that certain personalities may be more prone to pervasive negative affect (e.g., depression or anxiety) and experiences of life stress (Sher, 1991). Family history of substance use also has been linked to increased acute and delayed life stress (Sher, 1991; Shiffman & Wills, 1985). The relationship between engagement in pathological substance use and life stress is then moderated by the subjective experience of emotional distress. The ability to cope with distress is influenced by both cognitive ability and personality type and can reduce the experience of emotional distress despite life stressors. Lastly, certain substantive effects expected by users (i.e., stress reduction) are caused by coping deficits and enhance the

relationship between emotional distress and pathological use (Sher, 1991).

Research on gender effects indicates that the experience of negative affect significantly predicts substance use in girls over models primarily emphasizing impulsivity and externalization, which have garnered more support among boys (MacLean, Paradise, & Cauce, 1999). Girls are particularly vulnerable to negative affect during puberty due to hormonal changes (Angold, Costello, Worthman, 1998; Angold, Costello, Erkanli, & Worthman, 1999; Brooks-Gunn & Warren, 1989) and shifting social contexts and expectations (Brooks-Gunn & Warren, 1989; Brooks-Gunn, Attie, Burrow, Rosso, & Warren, 1989). Early sexual maturation among adolescent girls has been linked to increased negative affect and prospectively predictive of depression, disordered eating, and the initiation and increased use of substances use (Attie & Brooks-Gunn, 1989; Caspi & Moffitt, 1991; Garber, Lewinsohn, Seeley, & Brooks-Gunn, 1997; Wiesner & Ittel, 2002).

Negative life events continue to increase throughout development and elicit heightened emotional responses, particularly during adolescence (Colder et al., 2010; Larson & Hamm, 1993). Certain negative life events to which young girls and women are uniquely vulnerable are important determinants of substance use. Such life events can range from physical abuse and child neglect to sexual trauma and domestic violence, each of which significantly predicts of engagement in substance use (Fals-Stewart, Golden, & Schumacker, 2003; Kendler et al., 2000; Miller & Downs, 1995; Miller, Downs, Gondoli, & Keil, 1987; Miller, Downs, & Testa, 1993). Moreover, these experiences often lead to bouts of depression, anxiety, and posttraumatic stress disorder, which are highly comorbid with substance use and predictive of use motivated by

negative affect (Cottler, Nishith, & Compton, 2001; Grant & Harford, 1995; Sonne, Back, Zuniga, Randall, & Brady, 2003).

Though longitudinal research has not found significant associations between negative emotional experiences and substance use (Hill, White, Chung, Hawkins, & Catalano, 2000; Hussong, Curran, & Chassin, 1998), prospective and cross-sectional studies have found that negative affect significantly predicts substance use among adolescents and young adults. Low levels of positive affect prospectively predict tobacco, alcohol, and marijuana use (Colder & Chassin, 1997; Wills, Sandy, & Yaeger, 2001). Other studies suggest negative affect is significantly associated with and predictive of cigarette smoking, alcohol use, and marijuana use among college students over and above measures of stress (Magid, Colder, Stroud, Nichter, & Nichter, 2009) as well as cross-sectionally predictive of substance use across drug type (Carpenter & Hasin, 1999). Research using rats also have found that cocaine-predictive cues elicit negative affect states, measured by a decrease in dopamine secretion, that in turn predicts more cocaine seeking and administration attempts (Carelli & West, 2014; Gawin, 1991; Wheeler et al., 2011). The negative affect, therefore, predicts initiation of drug use as well as maintained use.

Weight Control as a Predictor of Drug Use

An alternative motivation behind drug use that has emerged in the literature is a desire for weight control. From unnecessary surgeries to restrictive diets, research suggests that women are willing to compromise health for the sake of beauty (Stice & Shaw, 2002). In a recent qualitative study, women of different ages reported that drug use for weight loss and maintenance was appealing due to wide availability, convenience,

perceived social acceptability, and a sense of reassurance in effectiveness (Mendieta-Tan, Hulbert-Williams, & Nicholls, 2013). With increased affordability and accessibility of drugs with metabolic properties, weight control may serve as a motivation for initiation or maintenance of drug use among college women.

Eating disorders, in particular bulimia nervosa, have been theorized to be culture-bound syndromes largely due to the prevalence and promotion of the thin ideal, characterized by a very slender body shape with little body fat, by Western societies (Stice, 1994; refer to Figure 2). Today, the diet and weight loss industry, capitalizing on this beauty standard, has become one of the largest and fastest growing in the world. Diet articles and advertisements promoting the thin ideal not only have increased exponentially over the decades (Garner, Garfinkel, Schwartz, & Thompson, 1980; Wiseman, Gunning, & Gray, 2007) but also appear ten times more in women's magazines than men's (Andersen & DiDomenico, 1992). By 2015, the global market focusing on products and services for weight loss and management is estimated to reach $671.8 billion, developing at a compound annual growth rate of 16.2% (Markets and Markets, 2010).

Several lines of evidence that support the hypothesis that a desire for weight control may be an important predictor of drug use will be discussed. Among the drug use literature, there is historical and current evidence of stimulant use for weight control specific to women (i.e., instrumental use of cigarettes as well as diuretics, laxatives, and over-the-counter diet pills). The comorbidity literature has found significant rates of drug use among individuals suffering from eating disorders and eating disorder pathology among women with drug use. Finally, theoretical models that predict drug use and eating

disorders have overlapping risk factors, suggesting the importance of multifinality as well as the vulnerability to one disorder simultaneously may increase the risk of the other.

Pharmacological agents have been used commonly for weight control as well as the ability to induce emesis. Extensive literature has investigated drugs of abuse typically associated with eating disorder psychopathology (Bulik, 1992; Bulik et al., 1992; Mitchell, Pomeroy, Huber, 1988; Roerig et al., 2003). These include diuretics, laxatives, emetics, and diet pills (Bulik, 1992; Bulik et al., 1992; Mitchell et al., 1988; Roerig et al., 2003). Like other compensatory behaviors, use of such substances is more characteristic of individuals who binge and purge than those who only restrict their caloric intake (Bulik et al., 1992; Cochrane, Malcolm, & Brewerton, 1998). For instance, diuretics, which was first documented among anorexic patients (Davidson & Silverstone, 1972; Wolff et al., 1968), are nearly five times more prevalent among individuals with bulimia nervosa than anorexia nervosa (Bulik et al., 1992). A similar trend is found among the prevalence rates for emetics and laxatives (Bulik, 1992; Bulik et al., 1992; Mitchell et al., 1988; Roerig et al., 2003). Moreover, pharmacological agents are used largely in combination (Corcos et al., 2001; Koepp, Schildbach, Schmager, & Rohner, 1993). Though a large number of women try pharmacological agents, continued use is only maintained by a small percentage of women (Bulik, 1992; Mitchell et al., 1988). Together, this suggests that women who continue to use pharmacological aids in combination have greater eating disorder psychopathology and are at higher risk for negative outcomes.

Licit stimulants, which include but are not limited to nicotine, caffeine, ephedrine, and phenylpropanolamine, have long been used for their metabolic effects. Amid the rise

of the Women's Movement in the 1920s, Lucky Strike, the leading cigarette industry, capitalized on the fight for women's social equality by changing smoking from a habit unbecoming of a lady to an acceptable weight loss aide with the tagline "Reach for a Lucky instead of a Sweet" (Brandt, 2007). In 1968, Virginia Slims, aptly named for the smaller diameter and intended consumer, was introduced as the first women's cigarette and would become one of the top four most successful brands by appealing to women's appearance and weight-driven insecurities (Toll & Ling, 2005). Today, cigarettes have lost popularity as a weight loss aide (Johnston et al., 2014). Yet, the use of weight-loss drugs, of which stimulants are a main ingredient, is the second most used method of extreme weight loss after skipping meals (Blanck et al., 2007; Holderness, Brooks-Gunn, & Warren, 1994; Lowry, Galuska, Fulton, Burgeson, & Kann, 2005; Lowry et al., 2000). Historic and current studies—both quantitative and qualitative in design—offer preliminary evidence that weight control can be an important risk factor for substance use among women.

High rates of comorbidity between eating disorders and substance use disorders within clinical samples further support this hypothesis. Rates of licit and illicit substances among those with eating disorder diagnoses are higher than that of the general population (Killen et al., 1987; Weiss & Ebert, 1983), suggesting eating pathology and drug use are distinctly related. For instance, about 35% of treatment-seeking women for substance abuse met either full or subthreshold criteria for an eating disorder (The National Center on Addiction and Substance Abuse (CASA), 2003). Similar findings were found among 204 women at an inpatient treatment center for substance use: 20% had been diagnosed with a comorbid eating disorder within their lifetime (Bonfa, Cabrini,

Avanzi, Bettinardi, Spotti, & Uber, 2008). However, anorexia nervosa and bulimia nervosa are relatively uncommon in the general population with base rates estimated to be .9% and 1.5%, respectively (Hudson, Hiripi, Pope & Kessler, 2007).

This is further evidenced when looking at rates of substance use disorders among those with eating disorders. Similar to that of diet aides, rates of substance use are more pronounced among bulimic women (Gadalla & Piran, 2007; Wiederman & Pryor, 1996). It has been estimated between 25% to 50% of women with bulimia nervosa and 13% of those with anorexia nervosa have a comorbid alcohol or substance use disorder, which is higher than that of the general population (Bapt et al., 1999; Bushnell et al., 1994; Newman & Gold, 1992). This broad range of comorbidity is likely due to changing criteria for both substance use dependence and severity of eating pathology for diagnoses. Later studies investigating use among eating disorder subtypes (i.e., anorexia nervosa-restricting subtype, anorexia nervosa-purging subtype, bulimia nervosa-purging subtype, and bulimia nervosa-non-purging subtype) or symptom clusters have suggested individuals who engage in bingeing and purging largely account for the high prevalence, regardless of diagnosis (Corcos et al., 2007; Stock, Golberg, Corbett, & Katzman, 2002; Strober, Freeman, Bower, & Rigali, 1996).

Similar trends emerge within the substance use literature. A high prevalence of binge episodes is frequently reported among users (Cochrane et al., 1998; Cohen et al., 2010; Ersche, Stochl, Woodward, & Fletcher, 2013). In addition, eating disorder psychopathology is common among women in treatment for substance abuse (Cohen et al., 2010; Greenfield, Back, Lawson, & Brady, 2010). Among 31 women seeking alcohol treatment, 25% met criteria for an eating disorder and 33% reported engaging in a

subjective binge episode within the last month (Peverler & Fairburn, 1990). Moreover, these women endorsed the most severe eating disorder behaviors, such as bingeing, excessive exercise, vomiting, and use of laxatives (Keel et al., 2003; Warren et al., 2013).

Women with these co-occurring diagnoses tend to have worse prognoses for treatment due to two factors. First, these women tend to be significantly younger than those without (Specker, Westermeyer, & Thuras, 2000), which is a predictor of higher relapse rates and worse prognosis (Anthony & Petronis, 1995; Cohen et al., 2010, Lewinsohn, Striegel-Moore, & Seeley, 2000; Franko et al., 2008). Second, a fear of weight gain is a major obstacle in treating drug abuse and repeatedly reported as a potential trigger for relapse (Cohen et al., 2010; Warren, Lindsay, White, Claudat, & Velasquez, 2013). The comorbidity literature not only lends support to weight control as a significant predictor of drug use but also suggests that the fear of weight gain can be a motivation for re-initiation of use. Thus, weight-related fears and eating pathology are important targets in treatment during the relapse prevention stage and are particularly pertinent among young women.

The relationship between binge behaviors and drug use continues to emerge within community samples. In a sample of 11,103 adolescents across American high schools, binge drinking and cocaine use positively predicted the number of disordered eating behaviors endorsed by the sample (Eichen, Conner, Daly, & Fauber, 2012). Cocaine use, in particular, was significantly predictive of purging behaviors for the overall sample and for men, when separated by gender (Eichen et al., 2012). Moreover, binge eating, a bulimic behavior examined in clinical studies, was significantly linked to negative consequences from drinking or marijuana use, binge drinking, and high rates of

cocaine use in community and university samples of women irrespective of other presenting disordered eating behaviors (Piran & Robinson, 2011).

The Sociocultural Model of Eating Disorders

Finally, negative affectivity is a key predictor in both the negative affective model of drug use and the sociocultural model of eating disorders, which suggests that its onset launches the development of another psychopathological trajectory (i.e., substance abuse) as well as its importance for prevention and intervention programs. The sociocultural model of eating disorders posits that internalization of the thin ideal leads to body dissatisfaction, initiating a dual pathway to eating disorders. Because women are more likely to be judged on the basis of their appearance (Harter, 1999), the model purports that women are more susceptible to internalizing the thin ideal and subsequent body dissatisfaction. Research demonstrates that awareness of beauty standards can be found in girls starting at the age of 5 and through childhood (Dohnt & Tiggeman, 2004; Flannery-Schroeder & Chrisler, 1996; Shapiro, Newcomb, Loeb, 1997) as well as women of all ages (Stice & Shaw, 1994; Levine, Smolak, & Hayden, 1994). The relationship between body dissatisfaction and eating disorders then is mediated by dieting and negative affect.

Awareness of the thin ideal leads to increased body dissatisfaction among girls and women by offering an unrealistic and unattainable standard to which they can evaluate their appearance (Harter, 1999; Kiang & Harter, 2006; Stice & Agras, 1998; Stice & Shaw, 1994). Though weight may moderate the relationship between internalization and body dissatisfaction (Stice, 1994; Tiggemann, 2005; Wilson, Tripp, & Boland, 2005), body dissatisfaction is a distinct construct (Stice, 2001; Stice & Shaw,

2002; Thompson & Stice, 2001). Healthy and unhealthy, overweight and underweight women alike experience dissatisfaction with body weight or shape (Rodin, Silberstein, & Striegel-Moore, 1984; Tantleff-Dunn, Barnes, & Larose, 2011).

Coupled together, internalization of the thin ideal and body dissatisfaction cause women to focus on improving their appearance through dieting (Stice, 1994; Striegel-Moore, 1992). Engagement in dieting begins at a young age. Over a fifth (22%) of a sample of 7-year-old girls reported previous attempts to lose weight, of which 20% restricted eating (Edlund, Halvarsson, & Sjoden, 1996). Engagement continues to rise throughout adolescence and into adulthood (Huon & Lim, 2000; Miller, Coffman, & Linke, 1980). Over a 2-year period, 20% of adolescent girls 12- to 16-years-olds began dieting, increasing the overall percentage of dieters to almost 70% by completion of the study (Huon & Lim, 2000). By college, dieting is normative with more than 90% of women engaging in some sort of dieting behavior (Grunewald, 1985; National Eating Disorder Association, 2013).

Contrary to popular belief, dieting is largely ineffective (Korkeila, Rissanen, Kapiro, Sorensen, & Koskenvuo, 1999; Mann, et al., 2007; Wadden, Sternberg, Letizia, Stunkard, & Foster, 1989). A recent review noted that not only did the majority of dieters actually gain more weight than lost on diets but also a history of dieting is predictive of weight gain, where weight regained was positively correlated with time of follow-up (Mann et al., 2007). One reason dieters fail is related to the tendency to engage in later binge eating episodes due to severe caloric deprivation (Huon, 1994, Lowe & Caputo, 1991; Neumark-Sztainer, Butler, & Palti, 1995). When dieting attempts are inevitably unsuccessful, self-esteem plummets (Heatherton, Herman, & Polivy,

1992). Dieters who engage in binge eating have lower self-concepts, higher drives for thinness, greater-risk psychological profiles, and employed more harmful weight loss strategies than dieters who do not binge eat (Huon, 1994; Lowe & Caputo, 1991; Neumark-Stzainer et al., 1995; Neumark-Stzainer, Wall, Haines, Story, & Einsenberg, 2007). Thus, failed dieting not only leads to eating disordered behaviors but also increases negative affectivity.

According to the sociocultural model of eating disorders, body dissatisfaction leads to negative affectivity that in turn promotes the engagement of eating disorder behaviors. However, it is also important to note that dieting also increases negative affectivity. The development of increased negative affect, increased body dissatisfaction, and failed dieting attempts mediate the relationship between internalization of the thin ideal and more extreme compensatory methods (Engler, Crowther, Dalton, & Sanftner, 2006; Stice, 1994; Stice, Nemeroff, & Shaw, 1996; Stice, Shaw, & Nemeroff, 1998). These methods, such as fasting, excessive exercise, vomiting, and laxative use, are prevalent disordered eating mechanisms concurrently and prospectively predicted by the sociocultural model (Engler, et al., 2006; Stice, 1994; Stice, et al., 1998). Grunewald (1989) found that the majority of college women were chronic or period dieters of which 34.9% fasted, 33.7% consumed diet supplements regularly, and 16.3% used liquid diets. Similarly, the National Eating Disorder Association (2013) recently found that 31% of college women will progress to pathological dieting, and between 20 – 25% will meet partial or full criteria for an eating disorder.

Instrumental Drug Use among College Women

In light of this research, few studies have investigated the potential instrumental

use of illicit psychostimulants, or use that is motivated by specific effects of a substance (WHO, 1997). Cochrane and colleagues (1998) found women were more likely to report weight motivations for initiation and continued use of cocaine. Recent qualitative literature suggests that even when drug use was not initiated out of weight concerns, positive feedback regarding weight loss and change in appearance after initiation became a maintaining factor for use (Sirles, 2002). In a similar vein, out of 364 college students, all who reported using cocaine for weight loss were women (Boys, Marsden, & Strang, 2000). Women also were more likely to endorse amphetamine use for weight loss purposes than males (Boys et al., 2000). These gender effects have been replicated among ecstasy- and methamphetamine-using women (Brecht, O'Brien, von Mayrhauser, & Anglin, 2004; Cance, Ashley, & Penne, 2005; Cohen, Greenberg, Uri, Halpin, & Zweben, 2007; Curran & Robjant, 2006; Semple, Grant, & Patterson, 2008; von Mayrhauser, Brecht, & Anglin, 2001). Research such as this indicates that college women may be particularly susceptible to psychostimulants use and motivated by appetitive effects and perceived promise of weight control.

Given that negative affect is a predictor of both prevalent disordered eating behaviors and substance use among women, this is a likely place for the two literatures to overlap. Driven by desperation to achieve the thin ideal and frustration with ineffective weight loss methods, highly body dissatisfied women may look to illicit substances with known appetitive effects. The negative affect developed and enhanced body image disturbance then becomes the beginning of a new pathway for drug use.

After initiation, substantive effects (i.e., increase in metabolic activity and subsequent weight loss) maintain use. Animal models have found that food deprivation,

what is achieved through pathological dieting, and subsequent binges increase drug-seeking and drug-taking (Puhl, Cason, Wojnicki, Corwin, & Grigson, 2011; Shumsky, Shlutz, Tonkiss, & Galler, 1997; Wellman, Nation, & Davis, 2007). Food deprivation is thought to enhance the substantive effects, such as faster metabolizing of the drug, prolonged high, and altered break down of fat, which allows for more binges without concomitant differences in body weight (Puhl et al., 2011; Ersche et al., 2013). Experience with stimulants then becomes positively reinforced through enhanced effect of the drug. Furthermore, use is reinforced by some of the same mechanisms that promote the thin ideal such as increased social status and positive feedback by family and peers (Sirles, 2002).

Current Study

As discussed in this literature review, significant comorbidity exists between eating disorder psychopathology and substance use. This has been demonstrated among community and clinical samples, yet few research studies have sought to explain the co-occurrence. Moreover, college women are particularly susceptible to pressures to achieve the thin ideal and try extreme weight-loss techniques after multiple failed dieting attempts. Because of the increased accessibility and affordability of drugs due to today's market and newfound freedom that accompanies a transition to college, dieting college women with heightened body dissatisfaction may try illicit stimulants as a method of weight control. Despite current research and the well-substantiated cost of drug use to society and individuals, college women are neglected by drug prevention programs. Therefore, an overarching goal of this research is to explore the extent to which a desire

for weight control motivates illicit stimulant use among college women due to known appetitive effects as a potential target of future prevention and intervention programs.

The purpose of this study was to conduct a series of preliminary descriptive analyses to explore whether college women are using illicit substances for weight-related purposes and if women with this motive are drawn to a particular class of drugs (i.e., stimulants). To support this objective, the prevalence of users motivated by weight control was compared between stimulant users and other drug users. A higher prevalence of use for weight control was hypothesized among stimulant users due to the anorectic effects of these substances.

A second objective of this study was to compare women who use stimulants for weight control purposes with established norms of eating pathology. Studies on college women have found that compensatory behaviors such as purging and laxative use typically have the most severe levels of eating disorder psychopathology, while compulsive exercise is associated with moderate levels of symptomatology (Davis, Holland, & Keel, 2014; Stiles-Shields, Goldschmidt, Boepple, Glunz, & Le Grange, 2011; Stiles-Shields, Labuschagne, Goldschmidt, Doyle, & Le Grange, 2012). Two studies that used samples of college women and the same eating disorder measure served as a benchmarks to the current sample in order to assess whether stimulant users for weight control could be seen as an eating disorder subgroup. It was hypothesized that scores among college women who engage in stimulant use for weight control will indicate greater pathology as compared to college norms.

Third, the study aimed to investigate whether stimulant users, as a class of drug users, differed from non-stimulant users on measures of key eating disorders risk factors.

College women who use illicit stimulants may be more at risk for eating pathology regardless of their explicit motivation for use due to the appetitive effects. Therefore, illicit stimulant use may have associations with thin-ideal internalization and body dissatisfaction similar to other weight control behaviors. Means on measures of thin-ideal internalization and body dissatisfaction were hypothesized to be significantly higher among stimulant users.

Lastly, the study aimed to address whether eating pathology could significantly predict use of illicit stimulants among college women. It was hypothesized that thin-ideal internalization, body dissatisfaction, binge eating, and engagement in other compensatory behaviors (e.g., excessive and compulsive exercise, purging, and laxatives) together and individually will significantly predict use of illicit stimulants (versus use of other drugs). Previous literature has shown that all of these factors are robustly predictive of engagement in other weight control behaviors (Engler et al., 2006; Stice et al., 1998; Striegel-Moore, 1992).

Method

Participants

Undergraduate women (N = 467) were recruited from a large, public, southwestern university as part of a larger study. As the current study aimed to assess motives for drug use among college women, those who did not report drug use within the last three months (n = 337) were excluded from the analyses. The resulting sample consisted of 130 college women, 27.83% of the full sample. Participants ranged in age from 16 to 24 (M = 18.76, SD = 1.09) with the majority being freshmen in college (62.3 %), followed by sophomores (6.9 %), juniors (3.1 %), and seniors (.8 %). The remaining

participants (26.9%) did not disclose school status. Over a fourth of the sample (26.2 %) identified as Hispanic. Participants were allowed to identify more than one race. As such, the majority identified as Caucasian (76.2 %) followed by Hispanic (23.1 %), Asian (10 %), African American (10 %), Pacific Islander/Hawaiian Native (3.8 %), Native American/Alaskan Native (3.8 %), and other mixed ethnicities (3.1 %).

Procedure

The present study was part of a larger, longitudinal research program investigating the large-scale dissemination and implementation of a cognitive dissonance program targeting reductions in thin-ideal internalization, body dissatisfaction, maladaptive dieting, and early eating disorder psychopathology. College women were personally invited to complete an online survey through university-wide emails sent to all freshmen women residing on campus. Women were recruited at the end of fall and spring semesters. Participants were informed they would be answering questions about a variety of health behaviors, including eating habits, physical activity, sexual promiscuity, drug and alcohol use, and social support. After giving consent, participants randomly completed batteries on these topic areas. College women were compensated for their time with the choice of either $15 or a free body composition assessment, which presented percentage of body fat, basal metabolic rate, metabolic age, bone mass, muscle mass, and total body water percentage.

Measures

Thin-ideal internalization. Thin-ideal internalization was assessed in two ways: the extent to which women agree with the thin ideal as a standard of beauty, measured by the Ideal-Body Stereotype Scale-Revised (IBSS-R; Stice, Ziemba, Margolis, & Flick,

1996), and how tangible rewards are once the thin ideal is achieved, as measured by the Body Image Culture Survey (BICS; Mazina, Zhang, Trockel, Weisman, Taylor, & Jones, submitted).

The IBSS-R captures the extent to which women ascribe to the thin feminine standard of beauty. This measure consists of 10 statements targeting overall attractiveness as well as specific body parts, such as legs, breasts, and butt. Example items include, "thin women are more attractive" and "women with long legs are more attractive." The IBSS-R assesses the extent to which participants agree with each item on a 5-point scale, ranging from *strongly disagree* to *strongly agree*. Items are averaged to create a global measure of thin-ideal internalization where high scores indicate greater internalization. The IBSS-R has demonstrated internal consistency (Cronbach's α = .89; Stice & Agras, 1998) test-retest reliability (r = .63; Stice, 2001) as well as convergent and predictive validity with measures of body dissatisfaction (Stice, et al., 1996). For the current study, alpha was .90.

Thin-ideal internalization also was measured by the perceived likelihood that quality of life would improve as a direct result of achieving the thin ideal. The BICS consists of 12 items assessing the participant's belief that professional success, social status, satisfaction with life and one's self, and personality would improve from losing weight. Examples include "being thinner than I am now would increase my current or future professional success;" "being thinner than I am now would increase others' interest in me;" and "being thinner than I am now would make me more outgoing." Participants indicate how likely these rewards are to occur on a 5-point scale, ranging from *no chance* to *certain to happen*. Items are averaged to create a thin-ideal internalization score where

higher scores represent greater internalization. A study examining its validity is under review (Mazina et al., submitted). In the current study, internal consistency reliability was high (α = .97).

Body Dissatisfaction. The Body Parts Satisfaction Scale-Revised (BPSS-R; Petrie, Tripp, & Harvey, 2002) assessed body dissatisfaction. The BPSS-R is devised of two subscales- satisfaction with body and satisfaction with face- that capture individual attitudes towards one's appearance. Fourteen items target specific body parts, (e.g., stomach, hips, and upper thighs), aspects of the face (e.g., complexion and overall face), and general features, such as muscle tone, height, and weight. Individuals rate their satisfaction on a 6-point scale, ranging from 1 (*extremely dissatisfied*) to 6 (*extremely satisfied*). The scale was recoded so that higher global scores, calculated by averaging items, indicated higher levels of body dissatisfaction. The BPSS-R has been shown to be internally consistent (α = .90) and has been significantly correlated with a variety of measures (Petrie, et al., 2002), such as Body Mass Index (r = -.32), the Body Shape Questionnaire (r = -.75) (BSQ; Cooper, Taylor, Cooper, Fairburn, 1987), and the Multidimensional Body Self-Relations Questionnaire—Appearance Evaluation subscale (r = .75) (MBSRQ; Cash, 1994). Internal consistency was high within the current study (α = .91).

Eating Disorder Pathology. Binge and compensatory behaviors were assessed through the Eating Disorder Examination - Questionnaire (EDE-Q; Grilo, Reas, Hopwood, & Crosby, 2015). The EDE-Q is a self-report measure adapted from the Eating Disorder Examination (EDE; Fairburn & Cooper, 1993), a widely regarded diagnostic interview (Garner, 2002). EDE-Q scores have been highly correlated with and

surpasses the EDE in capturing rates of binge eating episodes in particular (Fairburn & Beglin, 1994). The version of the EDE-Q (Grilo et al., 2015) used in the current study included 16 items targeting the core attitudes and behaviors of eating disorders (i.e., binge eating, vomiting, laxative use, and excessive exercise). Frequencies of each behavior (i.e., subjective binge eating episodes, excessive exercise, self-induced vomiting, and laxative use) are measured based on the number of days it occurred within the last month. For example, the items ask, "over the past 28 days how many times have you made yourself sick (vomit) as a means of controlling your shape or weight?"

For the purpose of this study, compensatory behaviors were based on a theoretical continuum of severity and coded to create an ordinal variable. Engagement in excessive exercise was coded as a 1, vomiting as a 2, and use of laxatives as a 3. Research has shown that nonpurging behaviors, such as excessive exercise and fasting, are associated with less body image disturbance and disordered eating as compared with purging behaviors, such as vomiting and laxative use (Davis et al., 2014; Schaumberg, Anderson, Reilly, & Anderson, 2014; Stiles-Shields et al., 2011). Those who engage in self-induced vomiting have more severe eating pathology (Schaumberg et al., 2014; Stiles-Shields et al., 2011) as well as comorbid disorders, such as depression, compared with those who engage in excessive exercise only (Stiles-Shields et al., 2011). Though laxative use is less common among those using compensatory behaviors, research has shown as much as 92.3% of laxative users use other compensatory behaviors (Stiles-Shields et al., 2012) and subsequently is associated to the most severe presentations of eating pathology (Schaumberg et al., 2014; Stiles-Shields et al., 2012). If more than one compensatory behavior was selected, the item was coded with the most severe behavior. This was done

to assess whether the engagement of a given behavior, irrespective of frequency, was related to stimulant use.

The EDE-Q also contains items of psychopathology separate from items assessing behaviors that comprise three subscales (Eating Concern, Shape Concern, and Weight Concern). Subscales were averaged together to generate a global index of eating disorder psychopathology. Previous studies have demonstrated the EDE-Q to be internally consistent with Cronbach's alpha ranging from .78 to .93 as well as test-retest reliability after a two-week period, r = .81 to .94 (Luce & Crowther, 1999; Mond, Rodgers, Hay, Owen, & Beumont, 2004). In the current study, Cronbach's alpha was calculated at .95 for the Earing Concerns subscale, .94 for Weight Concerns, .94 for Shape Concern, and .94 for the global index.

Drug use and motivation. Drug use within the last three months was measured through a self-report questionnaire created for the study. Three months was chosen in order to monitor changes in use before and after each semester. If participants reported any use within the last three months, they were presented a table of substances, including cigarettes, over-the-counter/prescription medications, marijuana, amphetamines, cocaine, ecstasy, heroin, and many others. Within this table, participants selected what substances they used and whether use was for recreation, for weight control purposes, or not applicable. Amphetamine, cocaine, ecstasy, and methamphetamine were classified as stimulants. Ecstasy was included, as it is considered a synthetic stimulant drug with hallucinogenic properties (Curran & Robjant, 2006; National Institute on Drug Abuse, 2013).

The answer choices "recreationally" and "not applicable" may have been vague for participants. To address this, college women (n = 7) were recruited to participate in a focus group investigating the interpretation of these answer choices. Seven participants received a survey (Appendix F) and participated in a cognitive interview (Appendix G) adapted from Chung and Martin (2005) regarding the drug use and motivation questionnaire. Results showed that the majority of participants (4) interpreted "recreationally" as for enjoyment in social contexts in which the "only goal [is] enjoyment." Others interpreted "recreationally" as capturing use for experimentation, for stress relief, or as continued habit. All participants interpreted "for weight control" as a desire to reduce appetite and "to be more active." The choice, "not applicable," however, was more ambiguous and was selected when a particular drug was not used, used for reasons other than enhancing a social experience (i.e., recreation) or to control weight, and used for more than one motive. Given this, motivation was coded dichotomously as either "for weight control" when selected and "not for weight control" when either "recreationally" or "not applicable" was selected.

Data Analyses

The data was examined using multiple approaches to achieve the intended objectives. First, prevalence rates of reported use for weight-control purposes were examined for significant differences between stimulant and non-stimulant users using a chi-square test. Second, eating pathology among college women using stimulants for weight control was compared with established norms using a benchmarking analysis in order to assess whether these women constitute an eating disorder subgroup. Two studies that administered the EDEQ to college women (Luce, Crowther, & Pole, 2008; Villarroel,

Penelo, Portell, & Raich, 2011) were used in this analysis. Global and subscale EDEQ scores from the current study's sample of stimulant users for weight control were compared with that found in the existing literature. Cohen's *d* was used to quantify the magnitude of the association between stimulant use and eating disorder pathology independent of sample size. Conventional benchmark scores as proposed by Cohen (1988) were used to determine the magnitude of the effect. Third, a series of *t* tests explored whether significant differences existed between stimulant-using college women and other drug-using college women on risk factors for eating disorders, such as thin-ideal internalization and body dissatisfaction.

Logistic regression then was used to test the ability to predict stimulant use from eating psychopathology. This statistical analysis is appropriate when determining the effects of independent variables on a dichotomous dependent variable. Odds-ratios were computed to determine the magnitude of the effect, where an odds-ratio of 1 indicates no relations but any deviation from 1 reflects the strength of that relationship. Logistic regression was used to predict stimulant use in comparison to other drug users. The first set of regression equations explored the relationship between thin-ideal internalization, body dissatisfaction, disordered eating behaviors and stimulant use. Use of stimulants or other drugs, measured by the drug use questionnaire, was entered as a dependent variable predicted by global thin-ideal internalization scores on the IBSS-R and BICS, level of body dissatisfaction on the BPSS-R, and binge eating and compensatory behaviors from the EDEQ. These independent variables were assessed individually and in a hierarchical order where thin-ideal internalization and body dissatisfaction were entered together first,

followed by engagement in binge eating, and finally, engagement in compensatory behaviors.

Prior to running the logistic regression analyses, tests for multicollinearity were performed for the two thin-ideal measures as well as a graphical check of the dichotomized responses to determine whether drug use linearly related to each of the predictors. Multicollinearity is indicated when zero-order correlation coefficients among predictors exceed $r = .50$ for moderately reliable measures or $r = .70$ single-item predictors. According to the guidelines outlined above, none of these correlations among the predictors suggested problems of multicollinearity (see Table 1). Variance inflation factors (VIF) among the independent variables (i.e., measures of thin-ideal internalization, body dissatisfaction, subjective binge episodes, and compensatory behaviors) also were well under the standard cut-off value of 3 across tests, indicating low levels of multicollinearity (Cohen, Cohen, Aiken, & West, 2003). Continuous variables were not significantly skewed (i.e., skewness did not exceed a value of 1); however, the binge eating variable had significant kurtosis and underwent a square root transformation.

Post-Regression Diagnostics. The potential impact of outliers on regression models was assessed using Cook's *D*, a statistic representing the sum of squared residuals for each case in the data set, and DFBETAS, a statistic representing the number of standard deviations the regression coefficient changes due to a certain case in the data set. Cook's *D* was used to investigate the global influence of individual cases on the omnibus tests of regression, while DFBETAS was used to investigate the influence of individual cases on specific regression coefficients. Typically, an outlier case is indicated when

Cook's *D* and DFBETAS have a value exceeding 1 (Neter, Wasserman, & Kutner, 1989). Following these guidelines, no cases with significant influence were detected.

Power. Power analyses were performed to determine the effect sizes that the analyses will have the ability to detect. The power analyses were conducted using G*Power 3.1 (Faul & Erdfelder, 1992). All analyses were run using a sample size of 130 and an alpha level of .05. A meta-analysis investigating eating disorders and substance use found a moderate effect of substance use with any eating disorder (d = 0.38) among 41 participants; studies investigating the effect among bulimic behaviors range from small (d = -0.07) to large effect sizes (d = -0.92) (Gadalla & Piran, 2007).

Two power analyses were conducted. First, power was calculated for a series of independent sample t-tests used to assess differences in levels of thin-ideal internalization and body dissatisfaction between illicit stimulant (n = 46) and other drug users (n = 84). Given the two unequal sample sizes and an alpha level of .05, the study was underpowered to detect small effects but obtained a power estimate of 0.86 for medium effects and 0.98 for large effects. Lastly, a power analysis was conducted for the series of logistic regression analyses. All predictors were included to provide a conservative estimate. The current study has sufficient power (> 0.80) to detect both medium (f^2 = 0.15) and large (f^2 = 0.35) effects when testing whether eating pathology, binge eating, and compensatory behaviors will predict stimulant use. However, the power to detect a small effect (f^2 =0.02) was well below the minimum power value of 0.80 suggested by Cohen (1988).

Results

Descriptive Statistics and Correlations

Correlations among all variables are displayed in Table 1, and descriptive statistics for stimulant users and non-stimulant users are presented in Table 2. Measures of thin-ideal internalization (i.e., IBSS-R and BICS) and engagement in subjective binge eating were coded so that higher scores indicate higher levels of the variable. Items on the BPSS-R were recoded so that higher scores represented higher levels of body dissatisfaction.

Forty-six (35%) drug-using college women were identified as stimulant users and 84 (65%) reported other drug use. Marijuana use was the most commonly used substance among both groups, with 89% of stimulant users and 82% of non-stimulant users endorsing use within the last three months. Polydrug use, as indicated by reporting use for recreation or weight control, was more common among stimulant users. Nearly every stimulant user (98%) endorsed use of another substance either for weight control purposes or for recreation. Those who reported not applicable of a substance were not included in these analyses due to the ambiguity of the answer choice.

Are stimulant users more likely to use for weight control than other drug users?

Hypothesis 1: Those who use drugs for weight control purposes are more likely to be stimulant users than other drug users.

As a first step to investigating whether illicit stimulant use may serve as another compensatory behavior, the prevalence of use for weight control was compared between stimulant users and other drug users. This is important, as previous literature has not explored whether the relationship between eating pathology and substance use is specific

to certain types of drugs, such as illicit stimulants. Reason for use was compared using a chi-square test. Out of 130 women, 19 women (14.6%) reported using drugs for weight control purposes of which the majority (68.4%) were stimulant users. Figure 3 shows the proportion of stimulant users and non-stimulant users who endorsed using for weight control purposes. A chi-square test indicated that the difference in the prevalence of use motivated by a desire for weight control between stimulant users and other drug users was statistically significant, $\chi^2(1) = 10.62$, $p = .002$. That is to say, there was a significantly higher prevalence of use motivated for weight control among stimulant users than among other drug users.

How do stimulant users for weight control compare to college norms on eating pathology?

Hypothesis 2: Stimulant users for weight control have more severe levels of eating disorder pathology.

Next, this subgroup of stimulant users whose use is motivated by weight control were compared to average rates of eating pathology for college women on a normed measured. It was hypothesized that those who use stimulants for weight control would have more severe levels of eating disorder pathology. Averaged global and subscale (i.e., Eating, Weight, and Shape) scores on the EDEQ among stimulant users for weight control were compared to established norms among undergraduate women (Luce et al., 2008; Villarroel, et al., 2011) and are presented in Table 3. Compared to the averages of undergraduate women published by Luce and colleagues (2008), the current sample differed on the Eating and Shape subscales by more than 1 standard deviation unit (see Table 5). A small to medium effect was found between the current study and that of

Luce et al. (2008) on the Weight subscale. Larger effect sizes were found between the current sample and Villarroel et al. (2011) on Eating and Shape Concerns, and Global EDEQ scores. Most notably, the mean of stimulant users motivated by weight control was higher by 1.72 standard deviation units than that reported by Villarroel and colleagues (2011) on the Eating subscale.

Do stimulant users as a class differ on risk factors for eating disorders from other drug users?

Hypothesis 3: Stimulant users, on average, will have higher scores on key risk factors for eating disorders than non-stimulant users.

Due to the known appetitive effects of illicit stimulants, it was hypothesized that women with greater eating pathology may use stimulants more than other drug types. As such, stimulant users would score higher on indices of thin-ideal internalization and body dissatisfaction, two well-established risk factors for eating pathology, than other drug users. A series of independent *t* tests were conducted to compare mean differences. Results of a Levene's test indicated that equal variances could not be assumed between stimulant users and non-stimulant users on the BICS, and as such, a Welch's *t* test was used to compare means on this measure. Table 2 reports the means and standard deviation for each condition. Contrary to the hypotheses, stimulant users did not significantly differ from non-stimulant users on thin-ideal internalization as measured by the IBSS-R ($t(125) = 1.01$, $p = .31$) or the BICS ($t(108.36) = .14$, $p = .89$). In addition, the groups did not significantly differ in reported levels of body dissatisfaction ($t(124) = 1.79$, $p = .08$).

As stimulant users were significantly more likely to use for weight control and those who did use for weight control were significantly elevated on measures of eating pathology, further post-hoc analyses were done to explore the lack of differences across thin-ideal internalization and body dissatisfaction. One theoretical reason for this may be that the non-stimulant group has equally elevated rates of eating pathology. Therefore, the comparison group may be engaging in a disordered eating behavior that subsequently relates to elevated scores on measures of thin-ideal internalization and body dissatisfaction. A Welch's *t* test was performed due to unequal variances between groups and compared stimulant users and other drug users on number of subjective binge episodes. Results indicated that non-stimulant users engaged in subjective binge episodes significantly more than stimulant users ($t(124) = -2.03$, $p = .04$), which may account for comparable scores on measures of thin-ideal internalization and body dissatisfaction.

Does level of eating pathology predict illicit stimulant use?

Hypothesis 4: Thin-ideal internalization, body dissatisfaction, binge eating, and engagement in other compensatory behaviors individually and together will significantly predict use of illicit stimulants over other drugs.

The final objective of the study was to assess if severity of eating pathology could predict illicit stimulant use. To answer this question, separate statistical models were run to examine whether an individual symptom of eating pathology could predict engagement in illicit stimulant use over other drug use using logistic regression. The effect of thin ideal internalization on stimulant use was examined first. Neither scores on the IBSS-R ($B = -0.27$, standard error [SE] = 0.27, odds ratio [OR] = 0.76, $p = .31$) nor on the BICS ($B = -0.02$, SE = 0.16, OR = 0.98, $p = .90$) significantly predicted the likelihood of

stimulant use. Scores of body dissatisfaction (B = -0.30, SE = 0.17, OR = .74, p = .079) also did not significantly predict the likelihood of engagement in stimulant use. Reports of subject binge episodes (B = -0.24, SE = 0.14, OR = 0.79, p = .10) did not have a significant effect on the likelihood of stimulant use. Lastly, the effect of engagement in compensatory behaviors on stimulant use was not significant (B = 0.35, SE = 0.21, OR = 1.42, p = .05).

Predictors were analyzed in a hierarchical order in order to assess the likelihood of stimulant use with increasing eating pathology. The regression coefficients for each step are presented in Table 4. First, the risk factors, thin ideal internalization and body dissatisfaction, were entered into the model. The combination of these risk factors did not significantly predict engagement in stimulant use. Second, engagement in binge eating, which has been found to be significantly associated with drug use, was entered into the model. There were no significant main effects. Lastly, engagement in compensatory behaviors was entered into the model. Engagement in compensatory behaviors significantly predicted stimulant use. When thin-ideal internalization, body dissatisfaction, and binge eating were held constant, a one-point increase in the severity of compensatory behavior doubled the odds that those individuals used illicit stimulants.

In order to further probe the significance of engagement in compensatory behaviors, this variable was dummy coded. First, engagement in compensatory behaviors at each level of severity were compared to no engagement. For this analysis, engagement in the respective behavior was coded as a 1 whereas non-engagement was coded as a 0. Though engagement in excessive exercise, a compensatory of mild severity, did not significantly predict stimulant use when compared to women who did not engage in any

compensatory behavior (*B* = .23, SE = .478, OR = 1.26, *p* = .63), engagement in a compensatory behavior of moderate severity (i.e., emesis) marginally increased the odds of women also engaging in stimulant use (*B* = 1.26, SE = .71, OR = 3.54, *p* = .08). Most notably, however, the odds of a woman who used laxatives (n = 7) engaging in illicit stimulant use were more than twenty times that of a woman who did not engage (n = 63) in a compensatory behavior (*B* = 3.03, SE = 1.13, OR = 20.63, *p* = .007).

Lastly, a series of dummy codes were used to analyze the differences between compensatory behaviors. Excessive exercise was compared to self-induced vomiting. Those who did not engage in compensatory behaviors and those who use laxatives were excluded from this analyses. Engagement in self-induced vomiting did not significantly predict stimulant use when compared to those who engaged in excessive exercise (*B* = .63, SE = .70, OR = 1.88, *p* = .37). When laxative use was compared to excessive exercise, excluding self-induced vomiting and non-engagers, laxative use significantly predicted engagement in stimulant use (*B* = 2.71, SE = 1.30, OR = 15.09, *p* = .04). However, laxative use did not significantly predict stimulant use when compared to self-induced vomiting (*B* = 2.89, SE = 2.13, OR = 18.01, *p* = .18).

Discussion

Although extensive literature has examined the co-prevalence of eating disorder pathology and substance use, few studies have sought to explain the co-occurrence. Those that have investigated reasons for use have suggested that weight-loss may be a motivating factor for substance use. The current study extends the literature by examining the extent to which a desire for weight control motivates use of specific substances with known appetitive effects (i.e., illicit stimulants) among college women.

A preliminary epidemiological investigation of eating pathology among substance using college women began to examine this issue through a series of questions.

First, the study aimed to answer whether drug-using college women were more likely to use of a certain class of drugs such as illicit stimulants for instrumental, anorectic effects when compared to other drugs. Results supported this hypothesis, suggesting use for weight control may be more prevalent among stimulant users than other drug users. This is in line with previous research that found women are more likely to report using illicit substances to lose weight in contrast to men (Boys et al., 2000; Cochrane et al., 1998; Sirles, 2002). This is particularly true for illicit stimulants, such as cocaine, amphetamines, ecstasy, and methamphetamine (Boys et al., 2000; Bretch et al., 2004; Cance et al., 2005; Cochrane et al., 1998; Cohen et al., 2007; Curran & Robjant, 2006; Semple et al., 2008; Sirles, 2002; von Mayrhauser et al., 2001). It is important to note that these results are conservative and may not reflect the extent of this phenomenon due to the limitations of the drug use questionnaire. Results of the focus group conducted suggested that women may choose *not applicable* rather than for weight control when there are multiple motivations for drug use. Moreover, it is unknown how often stimulant use is motivated by appetitive effects.

Knowing that stimulant-using college women are more likely to be motivated to use for appetitive effects, the study then aimed to assess how these women differed from college norms on measures of eating pathology. A benchmarking analysis showed that this subgroup of stimulant users had significantly higher levels of eating pathology overall as well as across specific domains of eating, shape, and weight concerns. Comorbidity literature has evidenced a distinct relationship between drug use and eating

pathology (Bapt et al., 1999; Bulik et al., 1992; Gadalla & Piran, 2007; Killen et al., 1987; Weiss & Ebert, 1983; Wiederman & Pryor, 1996). Yet, these results suggest that stimulant use for weight control may constitute a behavior distinct to a subgroup of eating disordered individuals similar to self-induced vomiting or laxative use, two other severe compensatory behaviors.

Given these findings, it was hypothesized that illicit stimulant users as a class of drug users would endorse greater levels of body dissatisfaction and thin-ideal internalization when compared to other drug users. Body dissatisfaction and thin-ideal internalization are integral concepts to the sociocultural model of eating disorders and initiation of acute and chronic dieting mechanisms, which include not only restriction of caloric intake but also excessive exercise, self-induced vomiting, and laxative use. Research suggests that body dissatisfaction in particular is higher among individuals who meet sub-threshold and clinical criteria for bulimia nervosa as oppose to anorexia nervosa or eating disorder-not otherwise specified (Cash & Deagle, 1997; Ruuska, Kaltiala-Heino, Rantanen, & Koivisto, 2005). Therefore, a significant difference between illicit stimulant users and other drug users across measures of these key risk factors would mirror elevations found among those with bulimic tendencies, suggesting illicit stimulants may function similar to other dieting techniques. Contrary to the study's hypothesis, no differences were found between types of drug users across either thin-ideal internalization or body dissatisfaction.

Post-hoc analyses revealed that binge behaviors significantly differed between stimulant and non-stimulant users. Subjective binge eating is characterized by a sense of loss of control over food consumption. Other drug users on average engaged in more

subjective binge episodes than stimulant users in the last month. As thin-ideal internalization and body dissatisfaction are two foundational constructs for the development of eating pathology, elevations also are present across disordered eating behaviors. That is to say, frequent binge eating, like compensatory behaviors, is associated with increased thin-ideal internalization and body dissatisfaction (Engler et al., 2006; Stice, 1994). Therefore, results may suggest that both stimulant users and other drugs users are at risk for eating pathology but for different reasons. As hypothesized, stimulant users may have elevated scores on these risk factors related to a pathological drive for thinness, while other drug users have elevated scores that arise from the consequential weight gain and increasing deviation from the thin ideal due to frequent engagement in binge eating. In sum, there might be two distinct eating profiles that are present but masked by the risk factors examined in the current study. Future research should investigate whether differences on other core eating disorder constructs, such as drive for thinness, emerge.

Research investigating differences among different types of drug users has not consistently found differences on body dissatisfaction. For instance, when comparing ecstasy-using to non-ecstasy-using women, Curran and Robjant (2006) found no differences on measures of body dissatisfaction and drive for thinness despite ecstasy-using women perceiving that ecstasy aided their weight loss and reporting more bulimic tendencies. Both ecstasy users and controls indicated use of other drugs, yet ecstasy users were significantly more likely to have used other stimulants (Curran & Robjant, 2006). As such, these results are comparable to the current study.

Polydrug use may contribute to similar reports of body dissatisfaction and thin-ideal internalization across drug classes. Substance use research has found not only predictable progression of drug use (e.g., "gateway theory") but also that drug users do not commit to one drug. Substantial research supports stages of progressive drug use throughout adolescence, beginning with licit substances–cigarettes or alcohol followed by use of marijuana and eventually, leading to use of other illicit drugs and abuse of prescribed medications (Kandel, 1975, 1980; Kandel & Faust, 1975; Kandel, Yamaguchi, & Chen, 1991; Yamaguchi & Kandel, 1984). In addition, use of even the most addictive drugs such as heroin or cocaine does not supplant the use of other drugs (Robins, 1993; Robins, Helzer, Hesselbrock, & Wish, 2010), suggesting that illicit stimulant use is unlikely to exclude use of other drugs. This may be particularly salient for cocaine and ecstasy, which are seen as party drugs. Use of these stimulants, though most prevalent, only may be used sporadically. As drug users were identified as either stimulant users or other drugs users based on any use of cocaine, methampethamine, amphetamine, or ecstasy within the last three months, frequency and severity of use cannot be addressed in this exploratory study.

Moreover, women who use stimulants like cocaine and ecstasy infrequently may use for weight maintenance rather than for weight loss. Recent research on the phenomenon of "drunkorexia" has evidenced that a growing trend among college students is to restrict caloric consumption of days of binge drinking (Barry & Piazza-Gardner, 2012; Burke, Cremeens, & Vail-Smith, 2010; Eisenberg & Fitz, 2014) and subsequently drink hard alcohol to avoid the calories in beer and wine (Eisenberg & Fitz, 2014). Though some engage in these behaviors to maximize the effects of drinking,

college women are more likely to engage in this out of a desire to control their weight (Eisenberg & Fitz, 2014). Similar to this, some women may engage in substance substitution, using an illicit stimulant rather than drinking on occasion, to avoid caloric consumption. Future research should investigate the frequency with which stimulants are used to control weight as well as the context. In addition, motivation for weight maintenance, which may include these substance substitution behavior, should be differentiated from motivation to lose weight. Women who are actively trying to lose weight by using illicit stimulants may use more frequently and have more severe eating pathology. Findings would illuminate whether a threshold of severity in drug-using behavior causes elevations in eating pathology.

What is clear is that women engaging in compensatory behaviors may be at increased risk of engaging in use of illicit stimulants. Risk of illicit stimulant use increased with engagement in more severe behaviors, such that the odds of engaging in use among women who used a severe compensatory behavior (i.e., laxative use) were 20-fold those among women who did not engage in any behavior and 15-fold when compared to women who engaged in a mild compensatory behavior (i.e., excessive exercise). These results are consistent with current literature in two ways. First, eating disorder research has shown that use of pharmacological aids, such as diuretics, laxatives, emetics, and diet pills, for weight control are maintained by a small portion of women with elevated eating pathology (Bulik, 1992; Mitchell et al., 1988) and, when maintained, are used in tandem with one another (Corcos et al., 2001; Koepp et al., 1993). Second, as previously discussed, use of one drug increases the risk of using other substances due to the progressive stages that occur in drug use (Curran & Robjant, 2006; Kandel, 1975,

1980; Kandel & Faust, 1975; Kandel et al., 1991; Robins, 1993, Robins et al., 2010; Yamaguchi & Kandel, 1984). These results extend the current literature by exploring which symptoms specifically are most closely related to illicit stimulant use among college women and highlighting the increased risk of illicit stimulant use among those engaging in severe compensatory behaviors.

Limitations & Future Research

Although the current study extended the literature, it was limited in a number of ways. Despite the sample size of 130 college women, the current study was underpowered for small effects in each analyses. There also was a small number of college women who engaged in laxative use, the most extreme compensatory behavior, or who used stimulants for weight control. As such, the results from both the logistic regression analyses and benchmarking analysis, though significant, need to be replicated among larger sample sizes. Moreover, the sample was predominantly freshmen, and the majority were sampled within the Fall semester, which limits the generalizability of these results. First-semester freshmen women may be systematically different from upperclassmen not only in their use of substances but also on body dissatisfaction and thin-ideal internalization. Social comparison focusing on physical appearances among women as well as engagement in illicit stimulant use may increase over time due to acculturation with the college environment. Additionally, ethnic and racial differences could not be examined due to the high proportion of women who identified as multiple races, preventing comparisons among homogenous groups.

Several limitations relating to the drug use questionnaire used must be noted. First, this questionnaire relied on retrospective report. This reliance is susceptible to

backward telescoping effects in which participants may overestimate the amount of time passed since recent use of a given drug (Janssen et al., 2006; Shillington et al., 2012) and may not accurately capture the prevalence of substance use (Moffitt et al., 2010). Second, the choices for reasons for use (i.e., for weight control, for recreation, and not applicable) did not lend itself to the creation of groups based on clear similarities on motivations for use. Because of this, only those who endorsed use for weight control and those who did not endorse use for weight control could be compared. The results of a focus group concerning the appraisal of these answer choices confirmed this. Moreover, these results suggested that women who use illicit substances for more than one reason may select an option other than "use for weight control" out of confusion, resulting in misidentified cases. Third, frequency of use was not assessed, which limits the interpretability of these findings as they may be driven by a small group of highly pathological individuals. Fourth, this questionnaire assessed only two motivations for drug use despite well-substantiated research suggesting other benefits of stimulant use, including but not limited to cognitive enhancement, which may be of particular importance among college students (Bagot & Kaminer, 2014; Franke , Lieb, & Hildt, 2012; Ilieva & Farah, 2013).

As the study was cross-sectional, temporal precedence was not established. Though the current study theorized that college women may be driven to use illicit stimulants by internalization of an ultra-thin stereotype of female beauty and subsequent dissatisfaction with one's body, the design did not allow for this model to be tested. Illicit stimulant users who reported use for appetitive effects did have significantly higher rates of eating pathology from reported norms among college women, despite not

differing on measures of risk factors. This may suggest that similar to other compensatory behaviors, highly motivated women engage in these behaviors to achieve a specific goal (i.e., weight loss). The anorectic effects and subsequent positive feedback from a society that perpetuates a thin standard of beauty for women promote continued use. Yet, as the thin ideal is unrealistic for the majority of women, its pursuit—in either abuse of licit substances like laxatives or use of illicit substances—increases eating pathology, as seen in illicit stimulant users for weight control.

Alternatively, it may be that some college women begin using illicit stimulants for other reasons, such as to enhance a social experience or reduce social anxiety, and consequently lose weight. Positive reinforcement regarding this side effect then predisposes some college women to use pharmacological aids like laxatives to enhance this effect. Continued research should aim to address how the negative affect model of substance use in tandem with the sociocultural model of eating disorders explains these co-occuring disorders. Other theoretical models of substance use should also be considered. For instance, the outcome expectancy model of substance use (Marlatt, 1985; Tiffany, 1999) may better explain eating pathology driving substance use, while the negative affect model may explain the movement from substance use to disordered eating behaviors. Both models of substance use should be considered in determining if two distinct trajectories emerge. Future research could identify stages of progression in use of typical drugs of abuse among eating disordered individuals (e.g., laxatives, diuretics, emetics, and syrup of ipecac) to use of illicit drugs, similar to what has been done in support of a gateway theory of substance use (Kandel, 1975).

Lastly, it should be acknowledged that the small sample of college women who endorsed using illicit drugs for weight control may signify that weight concerns are not a prominent motivating factor. An overarching goal of this research was to begin to explore effective targets for drug prevention programs for women. As risk factors for eating disorders generally predispose the onset of drug use for most women, this was theorized to be a potential area for intervention. Yet, the results of the current study could be interpreted as suggesting that weight concerns would not fair better as targets of intervention for young women over more generalized concepts, such as negative affect, low self-esteem, and concern for peer approval, which are incorporated into many early universal prevention programs. Programs, such as Life Skills for early adolescents and Project Towards No Drug Abuse, addressing these areas does reduce rates of substance use initiation for girls and boys when compared to control groups (Griffin & Botvin, 2010). Taken in tandem with literature suggesting the majority of substance users remit without intervention (Grant et al, 2015, Heyman, 2013; Meier et al., 2013) questions the relevance and importance of continuing this line of research. However, future research is needed in order to assess whether weight-related motives increases the risk for developing persistent hard-drug dependence, rather than substance use initation. If college women who use illicit drugs out of weight concerns are less likely to "mature out" of their substance behavior, then these women, though small in number, could be one of the more important at-risk groups to target with selective or indicated prevention programs.

Concluding Remarks

Although preliminary, these results suggest that a desire for weight control may be a strong motivating factor for illicit stimulant use among college women. Women engaging in more extreme weight-loss behaviors are at high risk for initiating and maintaining illicit stimulant use for similar weight-related motivation. College women who use stimulants for weight control have severe eating pathology. These unique motivations have not been previously targeted in substance use intervention and prevention programs. Given the vast literature demonstrating the immense pressure to be thin felt by college women in conjunction with the preliminary results of the current study, future research is needed to examine the development, the prevalence, and severity of this phenomenon.

Table 1

Intercorrelations among Measures of Eating Pathology and Stimulant Use

	1	2	3	4	5	6
1. IBSS-R[a]	1	-	-	-	-	-
2. BICS[b]	.37**	1	-	-	-	-
3. Body dissatisfaction	.25**	.40**	1	-	-	-
4. Sub. binge episode	.30**	.20*	.26**	1	-	-
5. Compensatory behavior	.33**	.27**	.29**	.22*	1	-
6. Stimulant use	-.09	-.01	-.16	-.15*	-.15	1

Note. Across measures, higher scores indicate higher levels of pathology. Compensatory behaviors were coded based on a theoretical underlying continuum of severity. Respondents were coded based on the most severe behavior reported such that higher scores indicate engagement in behaviors associated with higher severity. Stimulant use was coded as a binary variable. As such, the zero-order correlations reported indicate only an estimate of the association between engagement and a given variable.

[a]IBSS-R assesses the extent to which a woman ascribes to a thin ideal of beauty.

[b]BICS assesses the extent to which a woman believes her quality of life will improve as a result of achieving the thin ideal.

*$p < .05$, **$p < .01$

Table 2

Descriptive Statistics of Eating Pathology among Stimulant Using and Non-Stimulant Using College Women

	Stimulant Users[a]		Non-Stimulant Users[b]	
	N	Mean (SD)	N	Mean (SD)
IBSS-R[c]	43	3.85 (0.78)	84	3.99 (0.65)
BICS[d]	43	3.12 (0.96)	83	3.15 (1.28)
Body dissatisfaction	44	3.79 (1.20)	82	4.16 (1.06)
Sub. binge episode	43	0.64 (0.95)	83	1.14 (1.89)
Compensatory behavior	44	0.41 (0.82)	83	0.17 (0.46)
No engagement	41%		49%	
Excessive exercise	30%		37%	
Self-induced vomiting	13%		11%	
Laxative use	11%		2%	

Note. This table divided the total sample of drug-using college women into two groups based on use of illicit stimulants in the last three months. For each measure, higher scores indicate higher levels of pathology. Compensatory behaviors were coded based on a theoretical underlying continuum of severity. Respondents were coded based on the most severe behavior reported so that higher scores indicate engagement in behaviors associated with higher severity.

[a] n = 46 [b] n = 84 [c]IBSS-R assesses the extent to which a woman ascribes to a thin ideal of beauty. [d]BICS assesses the extent to which a woman believes her quality of life will improve as a result of achieving the thin ideal.

Table 3

Means and Effect Sizes of EDEQ Global Scale and Subscales Comparing Women who Used Stimulants for Weight Control from the Current Study with College Norms

	Current Study N = 12 M (SD)	Luce et al., 2008 N = 723 M (SD)	Villarroel et al., 2011 N = 708 M (SD)	Current study to Luce et al., 2008				Current study to Villarroel et al., 2011			
						CI (95%)				CI (95%)	
				Cohen's d	SE	Upper	Lower	Cohen's d	SE	Upper	Lower
Eating	2.33 (.97)	1.11 (1.11)	0.66 (0.97)	1.1	0.29	0.53	1.67	1.72	0.29	1.14	2.3
Weight	2.69 (.67)	1.97 (1.56)	1.51 (1.41)	0.46	0.29	0.11	1.04	0.84	0.29	0.27	1.41
Shape	3.83 (.99)	2.27 (1.54)	1.75 (1.50)	1.02	0.29	0.44	1.59	1.39	0.29	0.82	1.97
Global	2.95 (.73)	1.74 (1.3)	1.30 (1.19)	0.94	0.29	0.36	1.51	1.39	0.29	0.82	1.97

Table 4

Hierarchical Logistic Regression Analysis Predicting Stimulant Use

	Model Summary	Coefficients	
	Nagelkerke's R^2	*B*(SE)	*Exp(B)*
Step 1	0.03		
IBSS-R		- 0.22 (0.33)	0.8
BICS		0.15 (0.19)	1.17
Body dissatisfaction		- 0.27 (0.19)	0.76
Step 2	0.05		
Sub. binge episode		- 0.18 (0.15)	0.98
Step 3	0.14		
Compensatory behavior		0.76 (0.27)	2.14*

Note. For each measure, higher scores indicate higher levels of pathology. Compensatory behaviors were coded based on a theoretical underlying continuum of severity. Respondents were coded based on the most severe behavior reported so that higher scores indicate engagement in behaviors associated with higher severity.

[a]IBSS-R assesses the extent to which a woman ascribes to a thin ideal of beauty.

[b]BICS assesses the extent to which a woman believes her quality of life will improve as a result of achieving the thin ideal.

*$p < .05$, **$p < .01$

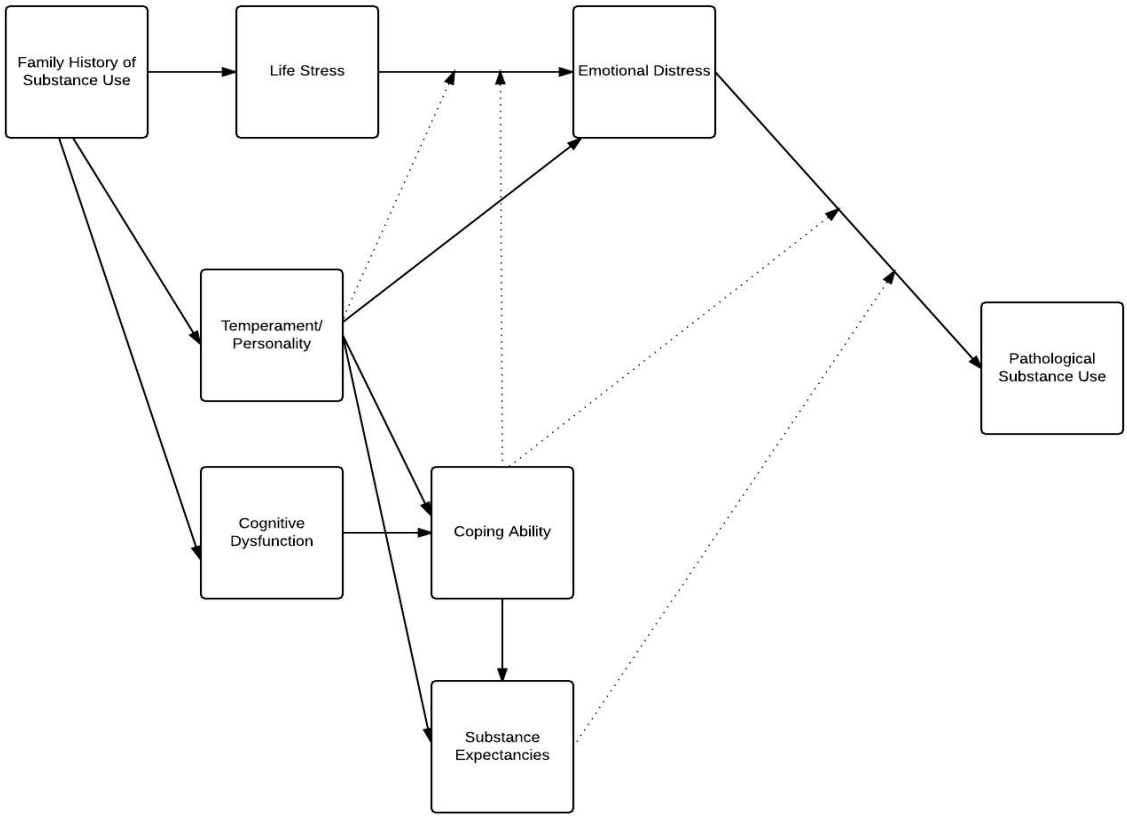


Figure 1. Negative Affect Model of Substance Use (Sher, 1991, p. 138)

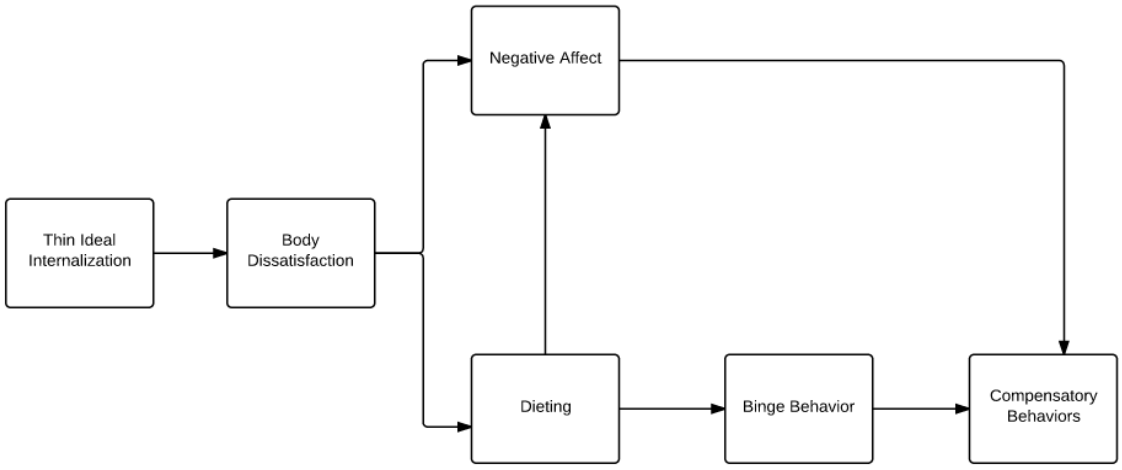


Figure 2. The Sociocultural Model of Eating Disorders (Stice, 1994)

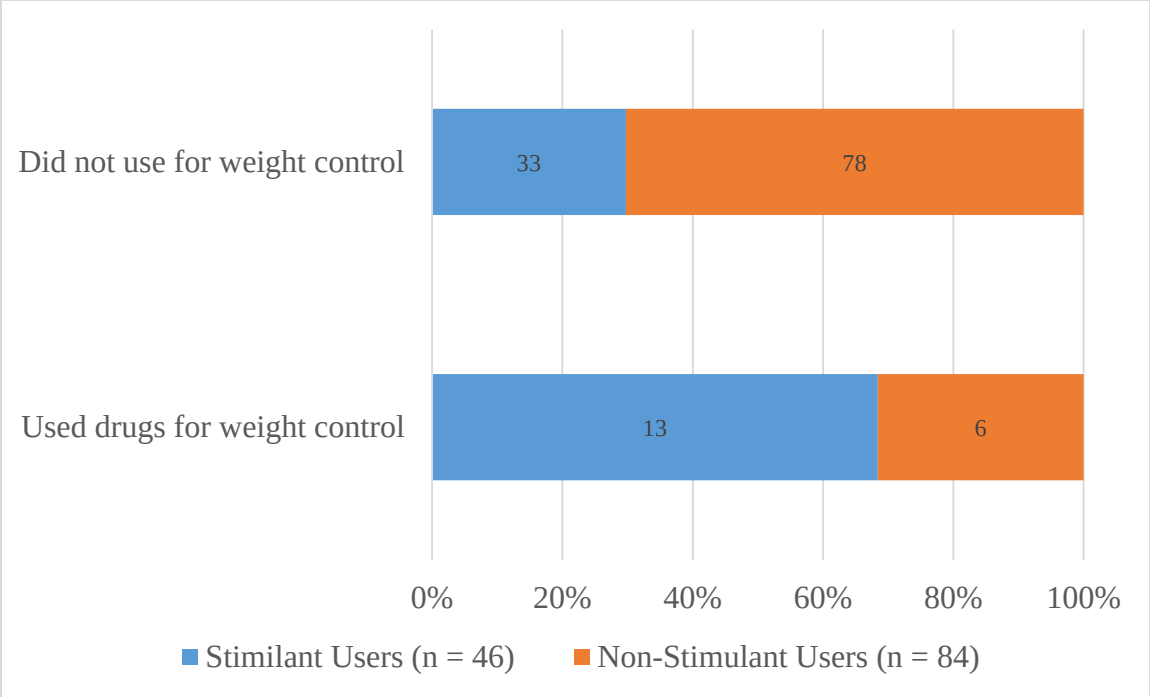


Figure 3.

Percentage of Stimulant Users to Non-Stimulant Users who Use for Weight Control

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APPENDIX A

IDEAL BODY STEREOTYPE SCALE – REVISED

Instructions: We want to know what attractive women look like. How much do you agree with these statements?

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
Slim women are more attractive.	❍	❍	❍	❍	❍
Tall women are more attractive.	❍	❍	❍	❍	❍
Women with toned bodies are more attractive.	❍	❍	❍	❍	❍
Women who are in shape are more attractive.	❍	❍	❍	❍	❍
Slender women are more attractive.	❍	❍	❍	❍	❍
Women with long legs are more attractive.	❍	❍	❍	❍	❍
Women with big breasts are more attractive.	❍	❍	❍	❍	❍
Women with shapely butts are more attractive.	❍	❍	❍	❍	❍

APPENDIX B

BODY IMAGE CULTURE SURVEY

Instructions: How likely is it that these things would happen to **you** as a result of being thinner than you are now?

Being thinner than I am now would… (refer to the next page)

	No Chance	Very Unlikely	Likely	Very Likely	Certain to Happen
Increase my current or future professional success	❍	❍	❍	❍	❍
Increase my sense of self-worth	❍	❍	❍	❍	❍
Increase my satisfaction with life	❍	❍	❍	❍	❍
Make me more popular among women	❍	❍	❍	❍	❍
Improve the overall quality of my life	❍	❍	❍	❍	❍
Increase others' interest in me	❍	❍	❍	❍	❍
Make me happier	❍	❍	❍	❍	❍
Make me more outgoing	❍	❍	❍	❍	❍
Make me more comfortable around men	❍	❍	❍	❍	❍
Make it easier for me to socialize	❍	❍	❍	❍	❍
Reduce my stress level	❍	❍	❍	❍	❍
Make me more friendly	❍	❍	❍	❍	❍

APPENDIX C

BODY PART SATISFACTION SCALE – REVISED

Instructions: Please rate how satisfied you are at this moment with each body part according to the following scale.

	Extremely Dissatisfied	Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Satisfied	Extremely Satisfied
Height	❍	❍	❍	❍	❍	❍	❍
Weight	❍	❍	❍	❍	❍	❍	❍
Hair	❍	❍	❍	❍	❍	❍	❍
Complexion	❍	❍	❍	❍	❍	❍	❍
Overall face	❍	❍	❍	❍	❍	❍	❍
Shoulders	❍	❍	❍	❍	❍	❍	❍
Arms	❍	❍	❍	❍	❍	❍	❍
Stomach	❍	❍	❍	❍	❍	❍	❍
Breasts	❍	❍	❍	❍	❍	❍	❍
Buttocks	❍	❍	❍	❍	❍	❍	❍
Hips	❍	❍	❍	❍	❍	❍	❍
Upper Thighs	❍	❍	❍	❍	❍	❍	❍
Lower Legs	❍	❍	❍	❍	❍	❍	❍
General Muscle Tone	❍	❍	❍	❍	❍	❍	❍

APPENDIX D

EATING DISORDER EXAMINATION QUESTIONNAIRE

1. Over the past 28 days, how many times have you eaten what other people would regard as an unusually large amount of food (given the circumstances)?

If Over the past 28 days, how ... Is Equal to 0, Then Skip To Over the past 28 days, how many times...

2. On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)?

3. Over the past 28 days, on how many DAYS have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food and have had the sense of loss of control at the time)?

4. Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight?

5. Over the past 28 days, how many times have you taken laxatives as a means of controlling your shape or weight?

6. Over the past 28 days, how many times have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape, or amount of fat, or burn off calories?

Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control over eating.

7. Over the past 28 days, on how many days have you eaten in secret (i.e., furtively)? (Do not count episodes of binge eating.)
    - ❍ No days
    - ❍ 1-5 days
    - ❍ 6-12 days
    - ❍ 13-15 days
    - ❍ 16-22 days
    - ❍ 23-27 days
    - ❍ Every day

8. On what proportion of times that you have eaten have you felt guilty (felt that you've done wrong) because of its effect on your shape or weight? (Do not count the episode of binge eating.)
    - ❍ None
    - ❍ A few times
    - ❍ Less than half
    - ❍ Half of the time
    - ❍ More than half
    - ❍ Most of the time
    - ❍ Every time

9. Over the past 28 days...

	Not at all	Slightly	Moderately	Markedly
Over the past 28 days, how concerned have you been about other people? (Do not count episodes of binge eating.)	❍	❍	❍	❍
Has your weight influenced how you think about (judge) yourself as a person?	❍	❍	❍	❍
Has your shape influenced how you think about (judge) yourself as a person?	❍	❍	❍	❍
How much would it upset if you had to weigh yourself once a week in the next 4 weeks?	❍	❍	❍	❍
How dissatisfied have you felt about your weight?	❍	❍	❍	❍
How dissatisfied have you felt about your shape?	❍	❍	❍	❍
How uncomfortable have you felt seeing your body; for example, in the mirror, in shop windows reflections, while undressing, or taking a bath or shower)?	❍	❍	❍	❍
How uncomfortable have you felt about others seeing your body; for example in communal changing rooms, when swimming or wearing tight clothes?	❍	❍	❍	❍

APPENDIX E

DRUG USE & MOTIVATION QUESTIONNAIRE

In the last 3 months, have you used drugs or cigarettes?

❍ Yes

❍ No

If No Is Selected, Then Skip to End of Block

Which of the following have you used:

	Recreationally?	For weight control?	Not Applicable
Cigarettes	❍	❍	❍
Over-the-counter or Prescription Medications	❍	❍	❍
Marijuana	❍	❍	❍
Hashish	❍	❍	❍
Heroin	❍	❍	❍
Opium	❍	❍	❍
Cocaine	❍	❍	❍
Amphetamine/ Speed	❍	❍	❍
Methamphetamine	❍	❍	❍
MDME/ Ecstasy	❍	❍	❍
Flunitrazepam/ Roofinol	❍	❍	❍
GHB/ Liquid Ecstasy	❍	❍	❍
PCP and Analogs	❍	❍	❍
LSD	❍	❍	❍
Mescaline/ Cactus	❍	❍	❍
Psilocybin/ Mushrooms	❍	❍	❍
Anabolic steroids	❍	❍	❍
Inhalants	❍	❍	❍

At what age did you first start using drugs?

At what age did you first start using drugs for weight control purposes?

APPENDIX F

DRUG USE & MOTIVATION APPRAISAL SURVEY

What was your understanding of this question?

1. What was your understanding of the answer choices?

2. What types of experiences would lead you to choose “recreationally”?

3. What types of experiences would lead you to choose “for weight control”?

4. What types of experiences would lead you to choose “not applicable”?

5. What might make this question too difficult or confusing?

6. If you took an illicit drug to enhance your experience at a party/music festival/some other event, which answer choice would you pick?
    a. Recreationally
    b. For weight control
    c. Not applicable

7. If you took an illicit drug to help you with school or work, what answer choice would you pick?
    a. Recreationally
    b. For weight control
    c. Not applicable

8. If you took an illicit drug for another reason (e.g., to help you focus on school or work; to enhance your experience at an event) but noticed it helped you lose weight, what answer choice would you pick?
    a. Recreationally
    b. For weight control
    c. Not applicable

9. If you never took a certain drug, what answer choice would you pick?
    a. Recreationally
    b. For weight control
    c. Not applicable

APPENDIX G

DRUG USE & MOTIVATION COGNITIVE INTERVIEW

We are trying to improve the drug use measure because the question and answer choices may be difficult to understand or confusing to answer. I will be asking you questions about your experience answering this measure and deciding how to respond so that the measure can be improved.

1. Please paraphrase how you understood the question.

2. Please paraphrase how you understood the answer choices.

3. What situations came to mind when trying to answer?

4. How did you decide to endorse:
    a. “recreationally”?
    b. “for weight control”?
    c. “not applicable?

5. What parts of the question were unclear or confusing?

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