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THE USE OF ELECTRONIC CIGARETTES FOR WEIGHT CONTROL AMONG COLLEGE
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THE USE OF ELECTRONIC CIGARETTES FOR WEIGHT CONTROL AMONG COLLEGE
WOMEN: A QUANTITATIVE ANALYSIS

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Abstract

Introduction. Existing evidence indicates some young adult cigarette smokers are motivated to smoke for weight control. Findings regarding young adult use of e-cigarettes for weight control is limited. As e-cigarettes are most popular among young adults, and college women have been found to use cigarettes for weight control more often than men, this study aimed to investigate the influences that drive college women to use e-cigarettes.

Methods. College women e-cigarette users who reported using their devices for weight control reasons ($N = 425$, $M_{\text{age}} = 21$) were recruited to participate in an online Qualtrics survey. Self-reported data were collected on demographics, body shape satisfaction, weight perception, and e-cigarette and combustible cigarette related behaviors. E-cigarette dependency was measured by the Penn State E-Cigarette Nicotine Dependence Index. The current study aimed to test associations between the use of e-cigarette for weight control and weight perception, body shape satisfaction, frequency of e-cigarette use, and tobacco use status.

Results. Logistic regression resulted show weight perception was significantly associated with e-cigarette use for weight control. Body shape satisfaction, frequency of e-cigarette use, and tobacco use status were not significantly associated. Chi-square analyses showed significant relationships between perceived underweight and the use of e-cigarettes for appetite suppression, often satisfied with body shape satisfaction and the use of e-cigarettes to control weight and suppress appetite, and dual tobacco use and the use of e-cigarettes to stop food cravings.

Discussion. Findings showed substantial evidence that some college women use e-cigarettes for weight control reasons. Health promotion interventions are needed to educate on healthy weight control strategies and the potential negative health outcomes of e-cigarette use to prevent the adoption of e-cigarettes for weight control among college women.

CHAPTER 1: INTRODUCTION

In 1964, the first Surgeon General's report cautioned Americans about the dangers of using tobacco, attributing tobacco to the underlying cause of many serious health problems (Centers for Disease Control and Prevention [CDC], 2019). Today, tobacco use is said to be the cause of more than 7 million deaths per year worldwide (World Health Organization [WHO], 2021). The CDC (2018) estimates that combustible cigarette smoking kills more than 480,000 Americans annually, including those afflicted by second-hand smoke. Due to the vast number of individuals affected both directly and indirectly, this behavior is regarded as the leading cause of preventable morbidity and mortality in the US today (U.S Department of Health and Human Services [USDHHS], 2014a). Though adult (≥ 18 years) use of combustible cigarettes has declined overtime (20.9% in 2005 to 14.0% in 2019), the CDC (2019) reported nearly 34 million American adults currently smoked combustible cigarettes in 2019. Further, it has been projected that, at the current smoking rate among U.S youth, 5.6 million of today's Americans <18 years old are expected to die prematurely from a smoking-related illness (CDC, 2020).

Most smokers initiate their use of tobacco products during adolescence. By age 18, 90% of smokers will have tried their first cigarette, progressing to a rate of 98% by age 26 (USDHSS, 2014b). Although the use of combustible cigarettes has decreased overtime, the use of electronic cigarettes (e-cigarettes) has proliferated since first being introduced to the U.S market in 2007 (Saddleson et al., 2016). Today, e-cigarettes are thought to be the most inconspicuous providers of nicotine (Fadus et al., 2019). Their design and method of operation generate not only ease of use and use without being detected but also the capability to provide high amounts of nicotine to users (Ickes et al., 2020). In the popular product, JUUL, a pod (i.e., disposable prefilled e-liquid cartridges that connect to and are heated by the USB styled battery) is advertised to contain up to

69 mg/ml of nicotine per pod— an amount suggested by JUUL to be equivalent to that of a pack of combustible cigarettes (JUUL, 2019; Talih et al., 2019).

Consumption of nicotine can increase heart rate and blood pressure, and long-term exposure has been seen to cause heart disease and damage, such as myocardial infarctions (Alzahrani et al., 2018; Glantz & Bareham, 2018). Further, consumption of nicotine throughout young adulthood can be hazardous to brain development (Inman et al., 2020), can increase the possibility of nicotine addiction, and may consequently lead to the initiation of combustible cigarette use and/or dual tobacco use (i.e., the use of e-cigarettes and combustible cigarettes; Barrington-Trimis et al., 2020; Barrington-Trimis et al., 2016; Loukas et al., 2018; National Academics of Sciences, Engineering, and Medicine [NASEM], 2018; Wang et al., 2019). Among adults (≥ 18 years), studies have shown some e-cigarette users initiate e-cigarette use in efforts to reduce their consumption of combustible cigarettes and/or to aid tobacco cessation efforts (Glasser et al., 2017; Saddleson et al., 2016; Vu et al., 2019). This strategy may be attributed to the popular belief that e-cigarettes are less harmful than combustible cigarettes while still providing nicotine (Bhatt et al., 2020; H. Y. Lee et al., 2018; Levy et al., 2018; Wackowski et al., 2020); though, there is conflicting existing evidence on whether e-cigarettes are a successful alternative to combustible cigarette use (Kalkhoran & Glantz, 2016; Worku & Worku, 2019).

A recent study (Hajek et al., 2019) found that e-cigarettes were more effective for aiding combustible cigarette smoking cessation than nicotine replacement therapy, though 80% of participants reported still using their e-cigarette device 1-year after ending their combustible cigarette use. Public health officials view this as problematic as the effects of long-term e-cigarette use are unknown (Sapru et al., 2020). In addition to concerns of long-term use, those in health-related fields have shifted their attention to the use of e-cigarettes among an otherwise

nicotine naïve population—youth and young adults who report e-cigarettes as their first exposure to nicotine. To date, young adults (ages 18–25) in the US make up the population with the highest prevalence of current e-cigarette use (Dai & Leventhal, 2019; Villarroel et al., 2020). Based on the declining trend of combustible cigarette use, it can be projected that if not for the introduction of e-cigarette products, youth and young adults would be using nicotine and tobacco products at considerably lower rates (Chapman et al., 2019).

Young adults have reported multiple reasons for their first time and continued use of e-cigarettes. Those most often cited are social and/or peer influence, ease of use (i.e., portable and lack of bad smell), curiosity surrounding e-cigarettes and their effects (i.e., high/buzz feeling), and as a method to relieve stress or for relaxation (Ickes et al., 2020). Although not as commonly reported, college students have also stated the use of e-cigarettes for weight control and appetite suppression (Bennett & Pokhrel, 2018; Correa et al., 2019; Napolitano et al., 2020; Pokhrel et al., 2020). Studies have shown some individuals intentionally use products containing nicotine, like e-cigarettes and combustible cigarettes, as they believe they are effective methods to managing their weight (Bloom et al., 2019; Morean & Wedel, 2017; Pokhrel et al., 2020; White, 2012; White et al., 2007). This intention may be a result of nicotine’s known pharmacological properties. In experimental studies, nicotine has been seen to reduce appetite and food cravings, as well as increase metabolism (Audrain-McGovern & Benowitz, 2011; Cepeda-Benito, 2020; Chiolero et al., 2008).

Paired with the pharmacological effects of nicotine, the behavioral component of smoking (i.e., “hand-to-mouth”) has been cited as a distraction to or replacement for eating food by both combustible cigarette and e-cigarette users (Grogan, 2016; Jackson et al., 2019; Kovacs et al., 2014). Further, e-cigarettes can be seen as playing a unique role in appetite suppression

considering their many existing and appealing flavors. In 2017, more than 15,500 flavors were identified and available for purchase online (Zhu et al., 2018). Prior to the U.S Food and Drug Association's [FDA] ban on sales of cartridge-based products in flavors other than tobacco and menthol in February 2020, sweet flavors (i.e., dessert, candy, fruit) were the most popular type of e-cigarettes (CDC, 2020). When using flavored e-cigarettes, which often imitate the taste of high calorie/fat food, individuals can avoid consuming the food the flavor mimics (Kong et al., 2015; Morean & L'Insalata, 2017; Morean & Wedel, 2017). Therefore, the combination of behavioral and functional factors involved with e-cigarette use leads to the potential for users to actively use e-cigarettes to control their weight, though they risk exposure to harmful levels of nicotine and potentially dangerous chemicals found within these products (Worku & Worku, 2019).

Numerous studies have examined the relationship between combustible cigarette use and weight control, with findings suggesting this phenomenon occurs most frequently among women (Audrain-McGovern & Benowitz, 2011; Bloom et al., 2019; French & Perry, 1996; French et al., 1994; Pinto et al., 1999; White, 2012). Though there is a lack of research regarding e-cigarette use for weight control, a recent study (Pokhrel et al., 2020) recognized college-aged women as a vulnerable group to performing this behavior. This identification could be a result of the prevalence of e-cigarette use among college students, as well as the recent marketing of these products for weight control (Morean & Wedel, 2017; Singh et al., 2018; USDHHS, 2016; Villarroel et al., 2020). Additionally, other contributing individual factors such as weight control expectancies, body dissatisfaction, disordered eating, weight concerns, internalization of social influences and society's thin ideal, and e-cigarette flavor preference, frequency of use, and dependence have all been seen to influence this behavior (Bornioli et al., 2019; Copeland et al., 2016; Grabe et al., 2008; Haynes et al., 2018; Kendzor et al., 2009; Luzius et al., 2019;

Napolitano et al., 2020; Piñeiro et al., 2016; Pokhrel et al., 2020; Stice & Shaw, 2003; Thompson et al., 1999; Vogel et al., 2018; Zucker et al., 2001).

Purpose of Study

The purpose of this study was to better understand the behavioral and cognitive use of e-cigarettes for weight control among college women, as well as the factors that contribute to this behavior. Although the relationship between college women who use combustible cigarettes for weight control has been well-established in the literature (Clark et al., 2005; Copeland et al., 2016; Copeland & Carney, 2003; Saules et al., 2004; Zucker et al., 2001), and there is growing evidence regarding college women who use e-cigarettes similarly (Bennett & Pokhrel, 2018; Napolitano et al., 2020; Pokhrel et al., 2020), due to the novelty of e-cigarettes, this area of research is still emerging. Pokhrel et al. (2020) states the existing evidence that e-cigarette weight control expectancies are predictive of higher e-cigarette use among young adults is scant and relatively weak (Pokhrel et al., 2020). Consequently, there is a need for additional research to understand this behavior among college women.

Findings from Correa et al. (2019) suggest young adults' expectancies and reasons for e-cigarette use fluctuate overtime. Tobacco companies' marketing of e-cigarettes may further influence these changes, especially when promoting use for weight control, as e-cigarette messages have been found to target young adults (USDHSS, 2016). Combined with the novelty and development of e-cigarettes, as well as the high rate of e-cigarette use among young adults, it is important to investigate what influences the development and progression of this behavior (Correa et al., 2019). By honing into these influences, this study attempted to build upon existing literature and help inform the public health field of this phenomenon and possible means of prevention. As nicotine is an addictive substance (U.S Food and Drug Administration, 2020),

college women who use e-cigarettes for weight control reasons may increase or alter their use overtime (e.g., transition to combustible cigarette use and/or dual use), therefore there is a need for intervention.

Research Questions

The following research questions were explored in this study:

- Research Question 1: Is there a relationship between weight perception and the use of e-cigarettes for weight control?

H₀: There is not a relationship between weight perception and the use of e-cigarettes for weight control.

H₁: There is a relationship between weight perception and the use e-cigarettes for weight control.

- Research Question 2: Is there a relationship between body shape satisfaction and the use of e-cigarettes for weight control?

H₀: There is not a relationship between body shape satisfaction and the use of e-cigarettes for weight control.

H₁: There is a relationship between body shape satisfaction and the use of e-cigarettes for weight control.

- Research Question 3: Is there a relationship between frequency of e-cigarette use and the use of e-cigarettes for weight control?

H₀: There is not a relationship between frequency of e-cigarette use and the use of e-cigarettes for weight control.

H₁: There is a relationship between frequency of e-cigarette use and tendencies to use e-cigarettes for weight control.

- Research Question 4: Is there a relationship between tobacco use status and the use of e-cigarettes for weight control?

H₀: There is not a relationship between tobacco use status and the use of e-cigarettes for weight control.

H₁: There is a relationship between tobacco use status and the use of e-cigarettes for weight control.

Delimitations

The subjects of this study were limited to:

- College enrolled females, ages 18–25, who report using e-cigarettes to control their weight, suppress their appetite, and/or to stop food cravings.

Limitations

The limitations specific to this study included:

- Information regarding e-cigarette use status, reasons for using e-cigarettes, body shape satisfaction, and weight perception were self-reported.
- Generalizations regarding other populations cannot be made from the results of this study.
- Causation cannot be applied for the relationship between participants use of e-cigarettes for weight control, frequency of use, reasons for use, body shape satisfaction and weight perception.
- Due to sensitivity of content and questions that will be asked for this study, participants' responses may have been influenced by their desire for acceptance (“social desirability”).

Assumptions

- Subjects completed eligibility survey and study survey honestly and accurately.

Operational Definitions

- Appetite Suppressant – a drug, supplement, or other method and/or behavior that reduces hunger.
- Body Shape Satisfaction – the subjective evaluation of the degree to which an individual has a positive or negative regard for their body shape (Cash, 2012; Pole et al., 2004; Saules et al., 2009).
- Body Weight Perception – an individual’s evaluation of their body weight as “underweight”, “normal weight”, or “overweight (Cheung et al., 2007; Tremblay & Limbos, 2009;).
- Electronic Cigarette (E-Cigarette) – a battery operated, handheld device which typically and closely resembles a combustible cigarette or USB drive. This product serves to deliver nicotine to the consumer by means of vapor, rather than combustion. Many e-cigarettes are available in a plethora of flavors, which contain chemicals that may be harmful to the consumers health, and can be disposable or refillable, depending on the product and user preference.
- E-Cigarette User – a person who currently uses e-cigarettes, regardless of the number of puffs, pods, hits, etc. they inhale per day.
- Weight Concerns – having elevated levels of worry about current weight and fear of gaining weight (Killen et al., 1996).

CHAPTER 2: LITERATURE REVIEW

Introduction

The purpose of this study was to better understand college women's use of e-cigarettes to control and/or maintain weight and the influences that contribute to this behavior. Previous studies have examined the use of combustible cigarettes as weight control among college-aged women (18–25) and factors which contribute to this behavior (Clark et al., 2005; Copeland et al., 2016; Copeland & Carney, 2003; Grogan, 2016; Howe et al., 2017; Lopez et al., 2009; Potter et al., 2004; Stice & Shaw, 2003; Zucker et al., 2001), although few have explored the use of e-cigarettes among college women for weight control (Bennett & Pokhrel, 2018; Napolitano et al., 2020; Piñerio et al., 2016; Pokhrel et al., 2020). To date, several existing studies have investigated the relationship between reasons for e-cigarette use, body shape satisfaction, and weight perception in regard to college women's e-cigarette use for weight control.

A systematic method was used to complete this literature review. Key words used to search for articles included electronic cigarettes, e-cigarettes, college, college women, body dissatisfaction, body satisfaction, body esteem, smoking, vaping, cigarettes, appetite suppressant, weight control, weight concerns, weight management, e-cigarette flavors, frequency, and dependence. No terms were excluded. PubMed, PsycINFO and Google Scholar were utilized to collect scholarly, peer reviewed journal articles that included one or more of these key terms and phrases. The structure of this chapter is organized by tobacco product type, health implications of use, history of use, reasons for use, outcomes of use, and factors contributing to use.

E-Cigarettes

Health Implications of E-Cigarette Use

Research indicates the use of pod-based e-cigarettes (e.g., JUUL) results in lower exposure to toxins when compared to combustible cigarettes and other types of e-cigarettes. Due to their novelty and evolution overtime, there is limited existing literature that confirms the long-term health effects of e-cigarette use on users' health (Lee et al., 2020; National Academies of Sciences, Engineering, and Medicine [NASEM], 2018; Sapru et al., 2020). However, as e-cigarettes contain substances that are known to cause pulmonary toxicity, many concerns have been raised for e-cigarette users' health (Chun et al., 2017). Chemicals found in e-liquids have been reported to compromise cell function (Eissenberg et al., 2020) and cause adverse health consequences to both cardiovascular and respiratory systems, while also increasing the risk for cancer development (Farber et al., 2021; NASEM, 2018). Further, bronchiolitis obliterans (“popcorn lung”)—a serious lung disease with symptoms akin to chronic obstructive pulmonary disease (COPD)—has been linked to the inhalation of the chemical diacetyl, which is found in many flavored e-cigarettes (Allen et al., 2016; US Department of Health and Human Services [USDHHS], 2016). One study (Allen et al., 2016) found diacetyl in 39 out of 51 flavors they tested. Although e-cigarettes are likely to pose less health risks to users than combustible cigarettes, there is growing evidence which reveals e-cigarettes are not harmless (NASEM, 2018) considering the dangerous chemicals found within them (Farber et al., 2021).

Health Implications of Nicotine Consumption

Nicotine, the main psychoactive ingredient in tobacco products, increases heart rate, blood pressure and arterial stiffness (Alcohol and Drug Foundation, 2020). Therefore, over time, nicotine exposure causes consumers to develop increased risk for heart disease (Franzen et al.,

2018; Nabavizadeh et al., 2018). Additionally, nicotine changes the signaling pathways of the brain, resulting in a cycle of dependence and withdrawal symptoms when ending use (National Institutes of Health [NIH], 2020). Young adults are said to be particularly susceptible to the harmful effects of nicotine as brain development occurs until age 25 (Gavin et al., 2009). Exposure throughout young adulthood can lead to decreased cognitive ability, as well as an increased risk for mental health disorders (Goriounova & Mansvelder, 2012). Lastly, due of the high nicotine content found in e-cigarettes, there is a greater likelihood for nicotine addiction among users (Kelder et al. 2020).

Concerns for Young Adult Transitioned and/or Dual Tobacco Use

Young adult e-cigarette use is concerning because, as previously mentioned, these individuals are considered a nicotine naïve population that would have substantially less consumption and exposure to nicotine if not for e-cigarette products (Kelder et al., 2020). A recent experimental study found the levels of nicotine delivered per puff were higher in the e-cigarette JUUL than in combustible cigarettes (Reilly et al., 2019) though JUUL claims equal amounts (JUUL, 2019). Nicotine levels within e-cigarette products has led to evident worries of nicotine addiction and, consequently, fears of renormalizing smoking culture as this addiction may cause a switch to, or dual use of, other tobacco products (Barrington-Trimis et al., 2016; Barrington-Trimis et al., 2020; Henningfield et al., 2018; Spindle et al., 2017; Talih et al., 2019). A study performed among undergraduate dual users found most (67%) participants reported using e-cigarettes before initiating their combustible cigarette use (Buckner et al., 2021). Further, Patel et al. (2019) found almost three-fourths (73.2%) of undergraduate current e-cigarette users also currently smoked combustible cigarettes. These findings suggest e-cigarette users may be subsequently vulnerable to combustible cigarette and/or dual use (Buckner et al., 2021; Glasser

et al., 2019), and that dual use rates may be even higher than previous findings (Coleman et al., 2017; Patel et al., 2019; Schoenborn & Gindi, 2015); though longitudinal research is needed to better understand college students transition from experimental- to sustained-use (Vallone et al., 2019; Willett et al., 2019).

E-Cigarettes Use Among Young Adults

History of Young Adult E-Cigarette Use

E-cigarette use among young adults, 18–25 years old, in the United States has increased rapidly since their market debut in 2007 (Ayers et al., 2011). Their pervasive use has led to the belief that e-cigarettes have produced an epidemic of young adult nicotine use (Bruijnzeel, 2020; USDHHS, 2012). Levy et al. (2019) refers to 2014 as the “tipping point” for e-cigarette use among young adults as retail sales showed relatively slow growth of e-cigarette use among this population through 2013, which more than doubled in 2014 (Marynak et al., 2017; USDHHS, 2016). In 2016, approximately 2.8 million e-cigarette users comprised this population (Mirbolouk et al., 2018). To date, college-aged students are the largest consumers of e-cigarette products in the U.S (Dai & Leventhal, 2019; Mirbolouk et al., 2018; Villarroel et al., 2020). As young adults’ use of e-cigarettes continues to grow, it is vital to understand the reasons why they use these products, as use may increase their susceptibility to lifelong nicotine addiction and result in negative health outcomes (Lee et al., 2020).

Reasons for Use Among Young Adults

E-cigarettes were initially developed as a less harmful alternative to combustible cigarettes. Cessation is frequently reported among adults (>18 years) as a reason for initiation and continued use (Abrams et al., 2018; Glantz & Bareham, 2018; Green et al., 2018). However many young adults do not report cessation as a reason for first time use. This may be because

many of these users' first exposure to nicotine is through e-cigarettes (NASEM, 2018; Soneji et al., 2018). The most commonly reported reasons for use among young adults include: curiosity (Ickes et al., 2020; Kinouani et al., 2020; Kong et al., 2015; Luzius et al., 2019; Patel et al., 2016; Soule et al., 2016), convenience (i.e., easy to use and always around; Kong et al., 2015; Patel et al., 2016; Pokhrel et al., 2015; Soule et al., 2016), ability to hide use (e.g., can use inside without detection; Kong et al., 2015; Pokhrel et al., 2015; Richardson et al., 2014; Saddleson et al., 2016), recreational entertainment (e.g., smoke tricks; Luzius et al., 2019; Patel et al., 2016), regulation of stress/anxiety (Ickes et al., 2020; Newcombe et al., 2021; Pokhrel et al., 2015; Soule et al., 2016), social aspects (e.g., socially acceptable, peer pressure, social influence; Ickes et al., 2020; Luzius et al., 2019), enjoyment (i.e., flavors and feeling; Kinouani et al., 2020; Kong et al., 2015; Luzius et al., 2019; Patel et al., 2016; Pokhrel et al., 2015; Saddleson et al., 2016; Soule et al., 2016), intention to quit or reduce consumption of combustible cigarettes (Etter & Eissenberg, 2015; Kinouani et al., 2020; Luzius et al., 2019; Patel et al., 2016; Pokhrel et al., 2015; Richardson et al., 2014; Saddleson et al., 2016; Soule et al., 2016), and belief they are less dangerous, less costly, and more socially acceptable in comparison to combustible cigarettes (Farsalinos et al., 2014; Hammett, et al., 2017; Hiler et al., 2020; Kinouani et al., 2020; Kong et al., 2015; Patel et al., 2016; Pokhrel et al., 2015; Saddleson et al., 2016; Soule et al., 2016).

Additionally, some young adults have reported using e-cigarettes as a method to suppress their appetite and/or for weight control (Bennett & Pokhrel, 2018; Bloom et al., 2019; Napolitano et al., 2020; Pokhrel et al., 2020), a behavior frequently seen among women combustible cigarette users (Bloom et al., 2019; Copeland et al., 2016; Copeland & Carney, 2003; French & Jeffrey, 1995; Klesges & Klesges, 1988; White, 2012).

Cigarette and E-Cigarette Use for Weight Control

History of Cigarettes for Weight Control

Women have especially been seen to hold beliefs that combustible cigarettes can be used as a method for weight control (French et al., 1994; Fulkerson & French, 2003; Grogan et al., 2009; Meyers et al., 1997; Piñeiro et al., 2016; Potter et al., 2004). The tobacco industry began advertising their products as such to women as early as 1919 with slogans and messages like, “Reach for a Lucky instead of a sweet”, “You can’t hide fat clumsy ankles. When tempted to over-indulge, reach for a Lucky instead”, and “Cigarettes are like girls; the best ones are thin and rich” (The National Center on Addiction and Substance Use at the University of Columbia, 2006). Though the metabolic effect combustible cigarettes have could explain the lower body mass index (BMI) seen in smokers when compared to non-smokers (Audrain-McGovern & Benowitz, 2011; Chiolero et al., 2008; Kaufman et al., 2012), research shows combustible cigarette use has also been associated with trying to lose weight and unhealthy dieting behaviors (i.e., fasting, diet pills, vomiting, laxatives; Lowry et al., 2002). Being that combustible cigarette smoking is also related to unhealthy eating and inconsistent physical activity, of which may increase the risk of obesity (Carroll et al., 2006), additional dieting behaviors in combination to combustible cigarette use may explain how women successfully manage or control their weight using these products.

Effects of Nicotine and Absence of Use on Users Appetite and Weight

Consumption of nicotine is known to stimulate the brain stem and stomach, resulting in increased energy expenditure and reduced appetite (Christensen, 2018; Filozof et al., 2004). These pharmacological effects (e.g., suppresses appetite, curbs food cravings, and increases metabolism) have been reported by both combustible cigarette and e-cigarette users to support

their belief that nicotine products can help control weight (Audrain-McGovern & Benowitz, 2011; Cepeda-Benito, 2020; Chiolero et al., 2008; Morean & Wedel, 2017; Pokhrel et al., 2020). In addition to these effects, the hand-to-mouth behavior involved with combustible cigarette and e-cigarette consumption has been identified as a hinderance to or substitution for eating food (Grogan, 2016; Jackson et al., 2019; Kovacs et al., 2014; Morean & L'Insalata, 2017; West et al., 2001). Further, those who are concerned about their weight are less likely to end combustible cigarettes and e-cigarette use, commonly citing weight gain as a reason for their reluctance to quit (Bennett & Pokhrel, 2018; Harris et al., 2016; Jackson et al., 2019; Rosenthal et al., 2013; Veldheer et al., 2015; White, 2012). Post-cessation weight gain can be attributed to the reversion of appetite and metabolic rate to pre-smoking levels, as well as the discontinuation of smoking as a distraction from eating (Williamson et al., 1991).

Despite the health benefits that occur during cessation, between 80–90% of combustible cigarette smokers experience weight gain during this period (Bush et al., 2016). A meta-analysis conducted (Aubin et al., 2012) between the years 1989 and 2010 found weight gain to be greatest during the first three months of quitting, with an average monthly gain of about two pounds. Additionally, a prospective study conducted by Lycett et al. (2011) found individuals who successfully ended their combustible cigarette use gained between 7–19 pounds within eight years. Though nicotine is known to decrease appetite and increase metabolic rate, it should also be noted that weight gain occurs naturally overtime; thus, not all post-cessation weight gain can be entirely credited to ending combustible cigarette use (Veldheer et al., 2015). Due to the novelty of e-cigarettes, there have not been any studies conducted to analyze post-cessation weight gain in those who attempt to stop e-cigarette use.

Women, Combustible Cigarettes and Weight Control

Among some women combustible cigarette smokers, weight control has been regarded as a key motive in their decision to use combustible cigarettes. For example, evidence shows some women initiate and continue smoking combustible cigarettes to reduce their appetite, assist dieting behaviors, and to maintain their current weight (Brandon & Baker, 1991; Grogan, 2016; Grogan et al., 2009; Potter et al., 2004; White, 2012). White's (2012) online cross-sectional study found those who consume combustible cigarettes, and who are especially concerned about their weight, are less likely to report the desire to stop smoking. This supports the previously mentioned findings in which some women smokers believe they can manage their weight by smoking, and fear gaining weight if they decide to quit (Perkins et al., 2001; Piñeiro et al., 2016; Pomerleau et al., 2001; Williamson et al., 1991). Further, a recent study (Bloom et al., 2019) of daily adult smokers suggests that weight-concerned combustible cigarette smokers are more likely to use e-cigarettes as an additional method of weight control due to the belief that these devices work as effectively as combustible cigarettes. As young adults often initiate their nicotine use with e-cigarettes, these findings support growing concerns of dual usage. Dual usage will result in excessive nicotine consumption; thus, some users may be strategically using tobacco products to maximize the appetite suppressing effects of nicotine in hopes to control their weight (Bloom et al., 2019; Buckner et al., 2021).

E-Cigarettes and Weight Control

Similar to findings for combustible cigarettes, there is growing evidence of the use of e-cigarettes to manage weight. A study conducted by Morean & Wedel (2017) found that approximately 14% of current e-cigarette users in the US reported actively using e-cigarettes to lose weight, while a study conducted among college students found a similar percentage (<15%;

Napolitano et al., 2020), and a longitudinal study among college women in Hawaii found around 4.8% reported using e-cigarettes for weight control reasons (Pokhrel et al., 2020). These results may be due to the outcome expectancies (i.e., weight loss, weight control, suppressed appetite) e-cigarette users attribute to these devices (Correa et al., 2019; Piñeiro et al., 2016; Pokhrel et al., 2020). Contrastingly, Dobbie et al.'s (2020) qualitative study among adult exclusive e-cigarette and dual users attempting cessation found limited awareness among participants that e-cigarettes could be used for weight control. Though there were examples of participants substituting e-cigarette use for eating or snacking, the authors found this was not the main reason for e-cigarette use rather an unconscious or coincidental action. This study highlights the need for future research to directly ask e-cigarette users about their weight control beliefs and intentions when using e-cigarette products to provide more insight on whether this is a conscious or unconscious decision, as well as to understand motives related to using these devices (Bloom et al., 2019; Correa et al., 2019; Pokhrel et al., 2020).

Contributing Factors for Nicotine Products and Weight Control

Outcome Expectancies

Outcome expectancies refer to individuals' beliefs regarding the results of performing a specific behavior (Bandura, 1986). Like combustible cigarette findings (Brandon & Baker, 1991; Brandon et al., 1999; Copeland et al., 1995), Harrell et al. (2019) found e-cigarette users' outcome expectancies encompass four major themes: positive reinforcement (e.g., pleasure, taste, buzz feeling, recreation), social benefits (e.g., time spent with friends), negative consequences (e.g., nicotine addiction, health risks), and negative affect reduction (e.g., reduction in food cravings, stress, social anxiety, boredom). Among young adults, weight control expectancies have been associated with e-cigarette use (Pokhrel et al., 2020), and young adult e-

cigarette first users have been seen to report greater weight control expectancies when compared to combustible cigarette first users (Buckner et al., 2021). Further, positive outcome expectancies for e-cigarette use are also associated with greater frequency of use among young adults (Correa et al., 2019). Correa et al. (2019) findings suggest young adults' expectancies for e-cigarette use change over time due to users' experience, marketing and promotion of e-cigarettes, and the evolution of e-cigarette products. Thus, more research is needed to understand how components specific to e-cigarette products (e.g., flavors and nicotine concentration) influence young adults' expectancies and frequency of use, and if e-cigarettes help young adults achieve weight reduction or maintenance (Napolitano et al., 2020; Pokhrel et al., 2020).

Weight Concerns

Weight concerns refer to individuals' elevated fears about their current weight and fears of gaining weight (Killen et al., 1996). College women in particular exhibit high levels of weight concerns (MacNeill et al., 2017; Stutts & Blomquist, 2020). Further, college women have reported using combustible cigarettes and e-cigarettes to reduce their weight concerns significantly more often than college men, as well as have higher reported weight concerns than their non-using counterparts (Bloom et al., 2019; Ogden & Fox, 1994; Piñeiro et al., 2016; Pokhrel et al., 2020; Saules et al., 2004; Zucker et al., 2001). Findings throughout the literature suggest weight concerns may not only influence combustible cigarette (French et al., 1995; French et al., 1994; Grogan et al., 2009; Killen et al., 1996) and e-cigarette (Mantey et al., 2020; Morean & Wedel, 2017; Pokhrel et al., 2020) initiation and continuation, but may also influence the progression to daily use. Those with greater weight concerns use both combustible cigarettes and e-cigarettes at high frequencies, suggesting weight concerns may motivate users to use tobacco products more frequently, especially if they believe use will lead to weight control

(Bennett & Pokhrel, 2018; Copeland & Carney, 2003; Delnevo et al., 2003; Grogan, 2016; Morean & Wedel, 2017; Napolitano et al., 2020; Pokhrel et al., 2020; Voorhees et al., 2002). These findings are primarily from White samples (Bloom et al., 2019; Grogan, 2016; Piñeiro et al., 2016; Saules et al., 2004; Wee et al., 2001).

Body Satisfaction

Negative body satisfaction, or body dissatisfaction, has been cited as a contributing factor to smoking for weight control among female combustible cigarette and e-cigarette users (Bornioli et al., 2019; Clark et al., 2005; Howe et al., 2017; Lopez et al., 2009; Lopez et al., 2008; Stice & Shaw, 2003). Women who report high levels of body dissatisfaction also report higher frequency of tobacco use. Researchers suggest these women likely use tobacco products to manage and cope with their high levels of body dissatisfaction (Bornioli et al., 2019; Camp et al., 1993; Copeland et al., 2016, Grogan, 2012; Kornblau et al., 2007; Napolitano et al., 2020; Pokhrel et al., 2020; Tomeo et al., 1999; White, 2012; Winter et al., 2002). The presence of body dissatisfaction has been well documented in college women and is presumed to be the result of pressures to achieve and/or maintain an ideal body size and internalization of sociocultural influences (e.g., media consumption, peer comparisons, familial and social influence; Forbes et al., 2012; Lopez et al., 2009; Nichter, 2015; Zucker et al., 2001). Though few studies have explored the relationship between body satisfaction and e-cigarette use among college women, findings from Pokhrel et al. (2020) are consistent with previous combustible cigarette studies among college women (Clark et al., 2005; Lopez et al., 2008) as the authors suggest those with higher body dissatisfaction are at an increased risk for using e-cigarettes to control their weight. As body satisfaction is believed to change over time (Karazsia et al., 2017), unravelling the relationship between body satisfaction and e-cigarette use in college women is important to

identify those at risk of using products like e-cigarettes for weight control purposes, as well as the development of accurate and appropriate interventions to address this behavior (Howe et al., 2017).

Body Weight Perception

Body weight perception involves an individual's assessment and identification of their weight (i.e., "underweight", "normal weight" or "overweight") irrespective of their actual body mass index (Cheung et al., 2007; Tremblay & Limbos, 2009). A distorted or inaccurate weight perception has been established in literature as a prospective risk factor for increased eating disorder symptoms, eating disorder maintenance, and unhealthy weight control practices (Brown et al., 2020; Haynes et al., 2018; Keel & Heatherton, 2010; Thompson & Stice, 2002; Wharton et al., 2008). Regardless of actual weight status, age, and race, findings from a systematic review indicate individuals who perceive themselves as overweight are likely to attempt weight loss using both healthy and unhealthy weight control strategies, though it is unclear whether this perception precedes the development of these strategies or vice versa (Haynes et al., 2018). A recent study (Wilson et al., 2019) found the majority of college female students (62.6%) correctly perceived their weight, though a substantial amount (31.2%) overestimated their weight. Looking across ethnicities, one study found White and Asian college females were more likely to overestimate their weight, while Black college females were more likely to underestimate their weight (J. Lee et al., 2018). These results may be explained by previous studies that show Black women have more positive body images when compared to non-Black women (Cash et al., 2004; Miller et al., 2000; Wildes et al., 2001).

Paradoxically, there is strong longitudinal evidence that perceived overweight predicts weight gain over time (Haynes et al., 2018). Researchers suggest this may be a result of overeating in response to weight stigma (Lee et al., 2021; Robinson et al., 2015). Weight stigma has also been found to lead to increased eating disturbances, depressive symptoms, anxiety, body image dissatisfaction and low self-esteem among overweight and obese adults (Wu & Berry, 2017), as well as increase vulnerability to tobacco use (Farhat, 2015; Farhat et al., 2010). Thus, the tendency for college women to engage in unhealthy weight control practices, such as using e-cigarettes for weight control, could be further explained by not only the perception of being overweight, but the stigma attached to it. Studies have found that when compared to their counterparts, e-cigarette users who report being overweight are more likely to use e-cigarettes to lose or control their weight (Bennett & Pokhrel, 2018; Morean & Wedel, 2017). Due nicotine's appetite suppressing effects and findings that show body weight perception influences weight control strategies more than actual body weight status (Liechty, 2010; Malinauskas et al., 2006), college women who are coping with perceptions of being overweight may intentionally use e-cigarettes to avoid overeating as a stress response to their weight perception (Haynes et al., 2018), and to ultimately control their weight (Pokhrel et al., 2020).

Social Influences

Broadly defined, social influences are the thoughts, feelings, attitudes, and/or behaviors individuals experience in response to an interaction with another individual or group (Rashotte, 2007). Social influences have shown to effect not only weight status and intentions for weight control in young adults (Leahey et al., 2012), but also e-cigarette use. Social acceptability, parental attitudes, and use of e-cigarettes among peers and siblings all influence young adults' e-cigarette use (Berg et al., 2015; Biener et al., 2015; Fite et al., 2018; Ickes et al., 2020; Kinouani

et al., 2020; Wallace & Roche, 2018). In particular, young adults cite peer influences as reasoning for initiating their e-cigarette use (e.g., friends offered their e-cigarettes), and socialization (e.g., ability to smoke with friends) for their continued use (Ickes et al., 2020). In addition, consumption of social media and exposure to e-cigarette related posts on social media by peers are significant predictors of combustible cigarette and e-cigarette initiation in college students (Depue et al., 2015; Phua et al., 2018; Pokhrel et al., 2021; Pokhrel et al., 2018; Sawdey et al., 2017; Trumbo & Kim, 2015; van Hoof, et al., 2014; Zhu, 2017). This may occur as social media platforms lend users the opportunity to express their thoughts and present their behaviors related to smoking and e-cigarette use, which in turn can foster social norms (i.e., the expectations or unwritten rules particular to a social group or culture), decrease risk perceptions of e-cigarette use (Krishen et al., 2020; Noland et al., 2016; Pokhrel et al., 2021; Yoo et al., 2016), and increase the number of peer comparisons made among college women (Fardouly et al., 2015).

Peer comparisons are the most influential social influence (Grabe et al., 2008; Tiggemann et al., 2011), and are commonly made among college women through intrapersonal interactions (i.e., social media, in person; Nichter, 2015; Perloff, 2014). Though no research has been conducted to investigate the impact of social influences on college women who use e-cigarettes for weight control reasons, because college women have high rates of social media use (Perrin, 2017; Smith & Anderson, 2018) they may also be exposed to more weight related messages and promotion of pro-smoking norms by peers and tobacco companies, as well as form more social comparisons (USDHHS, 2016; Yoo et al., 2016). Consequently, college women may have an increased risk to using e-cigarettes for weight control. Future research is needed to measure social media interactions, frequency of use, and exposure to e-cigarette related messages to see

how these factors influence college women's decision to use and continued use of e-cigarettes for weight control purposes.

E-Cigarette Marketing

E-cigarette marketing and advertising has been positively associated with college students appeal towards and intention to use e-cigarettes (Trumbo & Kim, 2015). E-cigarette companies use various platforms to advertise their products, though they largely disseminate advertisements through mainstream media and on the internet (e.g., social media channels; Ganz et al., 2015; Huang et al., 2014; Richardson et al., 2013; USDHSS, 2016), a tactic recognized to target young adults who frequent these platforms (Smith & Anderson, 2018; USDHSS, 2016). These advertisements typically incorporate themes that appeal to this population (e.g., independence, identify, lifestyle choice, healthier than combustible cigarettes), as well as showcase celebrities/popular figures to endorse their products (de Andrade et al., 2013; Simon, 2016). Recently, some e-cigarette companies have promoted their products for weight control and/or appetite suppression (Morean & L'Insalata, 2017).

Between the years 2004–2015, 23 patents were filed (12 in the US) to add weight loss medications to e-liquids or to create technologies for e-cigarette devices that support weight loss (Singh et al., 2018). Singh et al.'s (2018) investigation of these patents found that some had added laxatives to their e-liquids, a potentially dangerous method for users to achieve weight loss/control. Additionally, a handful described their product as having “appetite suppressants,” “botanical appetite suppressor,” “natural slimming agents,” “lipid and glucose metabolism,” and the ability to “promote weight loss” (Singh et al., 2018). As weight concerns are a strong predictor for smoking initiation (Verhaegen & Gaal, 2017) and thin-ideal media images have been seen to negatively affect women's body image, eating behaviors, and beliefs (Grabe et al.,

2008), concerns have been raised for college women—a population vulnerable to societal pressures of thinness (Dondzilo et al., 2019)—that targeted weight-control messages may influence their decision to use for e-cigarettes for weight control (Morean & L’Insalata, 2017; Pokhrel et al., 2020).

E-Cigarettes Flavors

Distinctive to e-cigarettes are the variety of flavors in which they can be purchased. When compared to other e-cigarette users, young adults have been found to use flavored e-cigarettes more than any other population, and consume multiple flavors (Harrell et al., 2017; Vu et al., 2019). Young adults are also more likely to report the availability of flavors as a primary reason for their e-cigarette initiation and use (Ickes et al., 2020; Wang et al., 2019). Among adult populations, e-cigarette users have reported using flavored e-cigarettes to ease food cravings and prevent episodes of binge eating (Morean, & L’Insalata, 2017). One study found the use of coffee and vanilla flavors were significantly associated with e-cigarette use to lose or control weight (Morean & Wedel, 2017). Further, a study among adults with a self-reported eating disorder found these users commonly reported using sweet tasting flavors to replace eating the high calorie and high fat foods the flavors mimicked (Morean & L’Insalata, 2017). By using e-cigarettes in this manner, users are offered a calorie-free alternative to consuming foods that are often refrained from when attempting weight loss or experiencing an eating disorder (Glover et al., 2018; Morean, & L’Insalata, 2017; Morean, & Wedel, 2017). Lastly, a recent study (Mason & Leventhal, 2021) among adults ages 18–35 years old found that higher sweet taste preference was associated with greater use of e-cigarettes for weight control motives, and that this association was more evident as BMI increased; thus, these individuals may use the availability of e-cigarette flavors to avoid eating unhealthy foods to attempt weight control.

Summary of Literature and Research Gaps

The relationship between college women who use combustible cigarettes for weight control has been well established, showing that levels of body dissatisfaction, weight concerns, disordered eating, social influences, internalization of society's thin ideal, frequency of use, and dependence greatly influence their decision to initiate and continue using these products (Clark et al., 2005; Copeland et al., 2016; Grogan, 2016; McEwen et al., 2008; Stice & Shaw, 2003; Zucker et al., 2001). As college women use e-cigarettes similarly and at high rates (Bennett & Pokhrel, 2018; Napolitano et al., 2020; Pokhrel et al., 2020; USDHHS, 2020), it is important to investigate the context and factors that contribute to their decision to use e-cigarettes for weight control. Although a basis has been formed to understand the use of e-cigarettes for weight control among college women, little is known about the extent, impact, and the interaction of these factors on this behavior. More research is necessary to understand how college women start and develop their use of e-cigarettes for weight control purposes as public health workers continue to express their uncertainties of long-term e-cigarette use on overall health, as well as the potential e-cigarette users have for dual and/or transitioned use of combustible cigarettes. The current study aimed to investigate 1) the relationship between weight perception and use of e-cigarettes for weight control, 2) the relationship between body shape satisfaction and the use of e-cigarettes for weight control, 3) the relationship between frequency of e-cigarette use and the use of e-cigarettes for weight control, and 4) the relationship between tobacco use status and the use of e-cigarettes for weight control.

CHAPTER 3: METHODS

The purpose of this study was to understand the underlying factors that contribute to college women's decisions to use e-cigarettes for weight control. Previous studies have looked at college women's use of both combustible cigarettes and e-cigarettes for weight control (Bennet & Pokhrel, 2018; Grogan, 2016; Napolitano et al., 2020; Pokhrel et al., 2020; Zucker et al., 2001); however, few have studied the reasons for using e-cigarettes for weight control and contributing factors to using these devices in this manner among college women (Bennett & Pokhrel, 2018; Napolitano et al., 2020; Pokhrel et al., 2020). Understanding and addressing factors that drive college women to use e-cigarettes for weight control reasons will be important for reducing e-cigarette initiation, as well as transition to dual use of tobacco products.

Research Design

A 51-question cross-sectional survey was used to explore college women's e-cigarette use, reasons for using e-cigarettes for weight control, as well as factors that may influence this behavior. The survey was estimated to take between 10–20 minutes to complete and was administered using Qualtrics, a web-based tool used to conduct survey research. Additional questions were asked about combustible cigarette use for weight control and dual use, perceived body size satisfaction, weight perception, and social influences. The questions within this survey were developed using validated scales and items previously used in literature (Adams et al., 2011; Bloom et al., 2019; Farris et al., 2018; Pomerleau & Snedecor, 2008; Schaefer et al., 2015). To answer the study's research questions, 36 questions from this survey were used (see Appendix A and B).

Based on the research design, potential threats to internal and external validity included selection of subjects and internal consistency. To mitigate selection bias, surveys were sent to all

female students at The University of Oklahoma after receiving Institutional Review Board (IRB) approval. Additionally, those who did not meet eligibility in the screener survey were not able to complete the survey. In efforts to decrease threats to internal consistency, the survey was reviewed by multiple professionals to ensure that order and wording of questions was acceptable before dissemination.

Sample

The sample for this study consisted of female undergraduate students, ages 18–25 years old, who reported using e-cigarettes for weight control, appetite suppression, or to stop food cravings. Based on previous studies (Bennett & Pokhrel, 2018; Napolitano et al., 2020; Pokhrel et al., 2020) and a power analysis conducted for a binary logistic regression, the researcher aimed to recruit 305 participants for an adequately powered study. After recruiting from February 2021 to May 2021, 2,094 participants attempted to take the survey and 582 participants successfully completed the screening and consented to be in the study. While 546 completed the survey, 121 were excluded from the study, leaving 425 participants for the analysis.

Inclusion and Exclusion Criteria

To determine participant eligibility, a screener survey (see Appendix A) was utilized as entry to the survey. Those who did not identify as female, did not report currently using e-cigarettes for weight control reasons, were not weekly e-cigarette users, were under the age of 18 or over the age of 25, and were not enrolled as an undergraduate student in the United States were not permitted to complete the survey. Before taking the survey, participants provided informed consent by reading the consent form provided on the first page of the Qualtrics survey and clicking “I agree to complete this survey.”

Recruitment

Purposive and snowball sampling were used to recruit participants as this was successful in other research among college women (Lee et al., 2017; Napolitano et al., 2020). Previous studies have successfully used campus-wide emails to recruit participants with screener surveys asking questions about age, sex, tobacco use and behavior (Bennett & Pokhrel, 2018; Peltier et al., 2019; Pokhrel et al., 2021; Pokhrel et al., 2020). Others have used anonymous online surveys with voluntary participants to analyze e-cigarette and cigarette use as weight control (Morean & Wedel, 2017; White, 2012).

For the present study, several recruitment strategies were employed to recruit participants that fit the research criteria. First, a campus-wide email with a flyer (see Appendix C) was sent describing the study and eligibility criteria. In addition to this recruitment strategy, the flyer was posted throughout campus (e.g., residence halls, cafeterias, educational and recreational buildings) with a brief study description, as well as Qualtrics link and Quick Response (QR) code to the survey. This same flyer was distributed throughout the community (e.g., community and virtual events) and at local businesses (e.g., restaurants, vape shops, nail and tanning salons, beauty stores, gyms, recreational facilities, coffee shops, boutiques, bars, liquor stores). Finally, social media posts were used similarly to recruit.

Data Collection

Data collection began February 2021 and closed in May 2021 (N = 425). All data was collected and managed through the University of Oklahoma's Qualtrics, a web-based survey medium that allows participants to anonymously complete online surveys via their computer, tablets, or smart-phones. At the end of the survey, respondents were linked to a separate

Qualtrics survey to collect their email information for incentive distribution (i.e., \$5 gift card to Starbucks) in order to ensure responses were not linked to any identifying information.

Measures

Eligibility Questions. To ensure participants were eligible to participate in this study, questions pertaining to their demographic information and e-cigarette use and behavior were assessed preceding the survey (see questions 1–4 of Appendix A). Participants were asked if they are currently enrolled as a part- or full-time student in the US, the gender with which they identify, their age, past 30-day e-cigarette use, and to identify one or more reasons for using e-cigarettes. Responses included, “healthier than smoking regular cigarettes”, “to stop food cravings”, “for stress relief”, “when I am hanging out with friends”, “when I am studying”, “to suppress my appetite”, “to control my weight”, “when I am drinking alcoholic beverages”, “when I am alone”, and other (fill-in). Participants were able to select multiple responses but were only able to access the survey by selecting, “to stop food cravings”, “to suppress their appetite”, or “to control my weight.” By asking participants to choose from these listed reasons and including the consent form after the screener survey, the purpose of the study was not communicated in order to refrain from influencing participants to answer questions in a particular manner.

Demographics. To characterize the sample, participants were asked the race they most identify with, whether they are of Hispanic, Latinx, or Spanish origin, their sexual orientation, current student status, enrolled credit hours, Greek life membership, and if they lived on or off-campus (Correa et al., 2019; Newcombe et al., 2021). For purposes of this study, the following variables were recoded to represent: race (i.e., 0 = White, 1 = American Indian or Alaska Native, 2 = Asian, 3 = Black or African American, 4 = Native Hawaiian or other Pacific Islander),

ethnicity (i.e., 0 = Non-Hispanic, 1 = Hispanic), sexual orientation (i.e., 0 = Heterosexual/Straight, 1 = Gay, Lesbian, or Bisexual), current sorority membership (i.e., 0 = no, 1 = yes), housing status (i.e., 0 = on campus, 1 = off campus, 2 = sorority house), and student status (i.e., 1 = 1st year/Freshman, 2 = 2nd year/Sophomore, 3 = 3rd year/Junior, 4 = 4th year/Senior).

Reasons for E-Cigarette Use. A multiple response survey item was used to ask participants to identify one or more reason(s) that explained their e-cigarette use from a list of commonly reported reasons found in the literature for e-cigarette use among young adults (Berg, 2016; Luzius et al., 2019; Kong et al., 2015; Newcombe et al., 2021). Food-related reasons included: to stop food cravings, to suppress my appetite, and to control my weight. Non-food related reasons included: healthier than smoking regular cigarettes, for stress relief, when I am hanging out with friends, when I am studying, when I am drinking alcoholic beverages, when I am alone, and other (fill-in response).

E-Cigarette Frequency. Frequency of e-cigarette use was measured using the single item, “I usually use an e-cigarette ___ days in a typical week” (Kasza et al., 2017).

E-Cigarette Dependence. E-cigarette dependence was measured using the Penn State E-Cigarette Nicotine Dependence Index (see pages questions 10–16 of Appendix B; Foulds et al., 2015). This is a 10-item scale, with scores ranging from 0–20. This scale has been validated in adults and has been used limitedly to measure dependence in adolescents (Vogel et al., 2018). Scores ranging from 0–3 indicate no dependence, 4–8 indicate low dependence, 9–12 indicate medium dependence, and 13+ indicate high dependence. The last three items from the scale were left off in the current study; thus, the score ranges were modified to 0 indicating no dependence, 1–5 low dependence, 6–9 medium dependence, and 10+ high dependence.

Dual Tobacco Use. To identify dual users, the question, “In the past 30-days, I have used an e-cigarette...” (once a week, twice a week, 3–4 times a week, 5–6 times a week, everyday) was used to measure e-cigarette use and, “In the past 30-days, have you smoked a cigarette, even one or two puffs?” (yes, no) was used to measure combustible cigarette use. Those who were weekly e-cigarette and reported smoking a combustible cigarette in the past 30-days were considered dual tobacco users (Kasza et al., 2017).

Flavor Preference. To measure flavor preference, participants were asked, “What is your preferred e-cigarette flavor?” (Kong et al., 2015; Morean & Wedel, 2017). Responses included tobacco, menthol, mint, vanilla, fruit (like strawberry, blueberry, or peach), candy or dessert (like apple pie, chocolate, or Jolly Rancher), alcohol (like pina colada, strawberry daquiri, or bourbon), and coffee (like espresso, latte, or cappuccino). Participants who reported using vanilla, fruit, candy/dessert, alcohol, and coffee flavors were classified as “sweet flavor” users, while participants who reported using tobacco were classified as “tobacco flavor” users, and participants who reported using mint and menthol flavors were classified as “mint or menthol flavor” users.

E-Cigarettes for Weight Control. The question, “From the following, please identify one or more reason(s) that explain your e-cigarette use” (see Appendix A, question 4) was used to measure participants’ use of e-cigarettes for weight control. Participants were able to select as many reasons as they wanted and were also given the option to fill in their own response. Those who reported the reason “to control my weight” by itself or in addition to other reported reasons were considered to use e-cigarettes for weight control.

Levels of Body Shape Satisfaction. A single-item measure, “I am satisfied with the shape of my body”, taken from the Dieting and Bingeing Severity Scale (Kurth et al., 1995) was

used to measure body shape satisfaction. Participants rated this statement on a scale from 1 (never) to 5 (always; Pomerleau & Snedecor, 2008). This tool has been validated among college women who do not meet all of the criteria for bulimia nervosa, but who engage in potentially dangerous weight control and binge-eating behaviors (Kurth et al., 1995). Lower scores indicate lower levels of body shape satisfaction, or body shape dissatisfaction. This variable was recoded to signify, 0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always.

Weight Perception. The prompt, “I am currently...” with responses “overweight,” “underweight,” and “have no current weight problem” was used to measure participant’s weight perceptions (Morean & Wedel, 2017). For analysis purposes, weight perception was recoded to represent: 0 = no current weight problem, 1 = underweight, 2 = overweight.

Data Management

Data collection occurred between February and May 2021. All data was exported from Qualtrics and analyzed using SPSS statistical software version 27.

Data Analysis Procedures

Descriptive Statistics. Descriptive statistics and frequencies were reported for age, race, ethnicity, sexual orientation, sorority status, housing status, and student status to characterize the overall sample.

Simple Comparisons. To look at basic relationships between variables, chi square analyses were conducted among nominal and ordinal variables, Pearson’s correlations were performed among continuous variables, and ANOVA tests were used among categorical and continuous variables.

Research Question 1. To answer research question 1 (Is there a relationship between weight perception and the use of e-cigarettes for weight control?), a logistic regression was

performed to test the association between the use of e-cigarettes for weight control (yes/no) and weight perception (no current weight problem, underweight, overweight), as seen in the first model (Table 1). Models following the first model were included to understand how additional variables interacted with the use of e-cigarettes for weight control and weight perception. The second model analyzed the interactions among weight perceptions, while controlling for the use of e-cigarettes for appetite suppression (yes, no), and the use of e-cigarettes to stop food cravings (yes, no). Model three controlled for e-cigarette days per week (1–7 days) and e-cigarette dependence (low, medium, high) in addition to the existing variables used in the second model. Using the variables from the third model, the final model added the demographics variables age, race, ethnicity, sexual orientation, and sorority status. Two-way interaction effects were tested between weight perception and the other variables during these analyses. Significant two-way interactions were reported ($\alpha = .05$).

Table 1

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control

Variable	Model 1	Model 2	Model 3	Model 4
Weight perception	x	x	x	x
Reason: Appetite suppression		x	x	x
Reason: Stop food cravings		x	x	x
E-cigarette days per week			x	x
E-cigarette dependence			x	x
Age				x
Race				x
Ethnicity				x
Sexual orientation				x
Sorority				x

Research Question 2. To answer research question 2 (Is there a relationship between body shape satisfaction and the use of e-cigarettes for weight control?), a logistic regression was

performed to test the association between the use of e-cigarettes for weight control (yes/no) and body shape satisfaction (never, rarely, sometimes, often/always), as seen in the first model (Table 2). Body shape satisfaction was recoded so that never = 0, rarely = 1, sometimes = 2, and often/always = 3; this last group was combined because the observed counts of always satisfied were much lower than those seen for the other responses (n = 10). Models following the first model were included to understand how additional variables interacted with e-cigarettes for weight control and body shape satisfaction. The second model analyzed the interactions among body shape satisfaction, while controlling for the use of e-cigarettes for appetite suppression (yes, no), and the use of e-cigarettes to stop food cravings (yes, no). Model three controlled for e-cigarette days per week (1–7 days) and e-cigarette dependence (low, medium, high dependence) in addition to the existing variables used in the second model. Using the variables from the third model, the final model added the demographics variables age, race, ethnicity, sexual orientation, and sorority status. Two-way interaction effects were tested between body shape satisfaction and the other variables used in the logistic regression. Significant two-way interactions were reported ($\alpha = .05$).

Table 2

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control

Variable	Model 1	Model 2	Model 3	Model 4
Body shape satisfaction	x	x	x	x
Reason: Appetite suppression		x	x	x
Reason: Stop food cravings		x	x	x
E-cigarette days per week			x	x
E-cigarette dependence			x	x
Age				x
Race				x
Ethnicity				x
Sexual orientation				x
Sorority				x

Research Question 3. To answer research question 3 (Is there a relationship between frequency of e-cigarette use and the use of e-cigarettes for weight control?), a logistic regression was performed to test the association between the use of e-cigarettes for weight control (yes/no) and frequency of e-cigarette use (1–7 days per week), as seen in the first model (Table 3). Models following the first model were included to understand how additional variables interacted with e-cigarettes for weight control and frequency of e-cigarette use. The second model controlled for e-cigarette dependence (low, medium, high) and combustible cigarette use (yes/no). The final model controlled for the demographic variables age, race, ethnicity, sexual orientation, and sorority status in addition to e-cigarette dependence and combustible cigarette use. Two-way interaction effects were tested between e-cigarette use days per week and the other variables used in the logistic regression. Significant two-way interactions were reported ($\alpha = .05$).

Table 3

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control

Variable	Model 1	Model 2	Model 3
E-cigarette days per week	x	x	x
E-cigarette dependence		x	x
Combustible cigarette use		x	x
Age			x
Race			x
Ethnicity			x
Sexual orientation			x
Sorority			x

Research Question 4. To answer research question 4 (Is there a relationship between tobacco use status and the use of e-cigarettes for weight control?), a logistic regression was performed to test the association between the use of e-cigarettes for weight control (yes/no) and

dual tobacco use (yes, no), as seen in the first model (Table 4). Models following the first model were included to understand how additional variables interacted with e-cigarettes for weight control and tobacco use status. The second model analyzed the interactions among other food-related reasons reported and not reported for e-cigarette use (appetite suppression and to stop food cravings) The third model added onto the second model with the inclusion of the e-cigarette dependence (low, medium, high). The final model added the demographics variables age, race, ethnicity, sexual orientation, and sorority status. Two-way interaction effects were tested between tobacco use status and the other variables used in the logistic regression. Significant two-way interactions were reported ($\alpha = .05$).

Table 4

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control

Variable	Model 1	Model 2	Model 3	Model 4
Dual tobacco use	x	x	x	x
Reason: Appetite suppression		x	x	x
Reason: Stop food cravings		x	x	x
E-cigarette days per week			x	x
E-cigarette dependence			x	x
Age				x
Race				x
Ethnicity				x
Sexual orientation				x
Sorority				x

CHAPTER 4: RESULTS

Descriptive Statistics

Participant Characteristics. A total of 2,094 individuals attempted to take the study survey; 582 individuals were considered eligible based on their responses to the screener survey. To meet the eligibility requirement, participants had to complete the entire survey, be female, 18–25 years old, college enrolled students, at least weekly e-cigarette users, and reported using e-cigarettes to control their weight, suppress their appetite, and/or to stop food cravings. Participants were excluded from the study if they did not complete every answer on the survey ($n = 36$), answered the entire survey in less than 420 seconds (7 minutes; $n = 99$), took the survey outside of the US ($n = 4$), did not fall into the age range of 18–25 ($n = 3$), answered with unrelated or random responses ($n = 8$), consistently chose the same responses ($n = 5$), and if surveys were taken numerous times by the same IP address ($n = 2$). After removing these individuals, a total of 425 participants were used for data analysis.

Descriptive statistics for the overall sample are presented in Table 1. The majority (61.9%) of participants fell in the age range of 20–22 years old. While over half identified as White, nearly half of the sample (44.7%) reported Hispanic ethnicity. Participants were predominantly heterosexual (79.1%) and pledge, new or initiated members of a social sorority (81.9%).

Table 1*Participant Characterization (N = 425)*

Characteristic	n (%)
Age	
18	32 (7.5%)
19	40 (9.4%)
20	130 (30.6%)
21	74 (17.4%)
22	59 (13.9%)
23	49 (11.5%)
24	18 (4.2%)
25	23 (5.4%)
Race	
American Indian or Alaska Native	53 (12.5%)
Asian	17 (4.0%)
Black or African American	71 (16.7%)
Native Hawaiian or other Pacific Islander	27 (6.4%)
White	257 (60.5%)
Ethnicity	
No, not of Hispanic, Latino/a or Spanish origin	240 (56.5%)
Mexican, Mexican American, Chicano or Chicana	135 (31.8%)
Puerto Rican	30 (7.0%)
Cuban	20 (4.7%)
Sexual Orientation	
Bisexual	65 (15.3%)
Gay or Lesbian	24 (5.6%)
Heterosexual or Straight	336 (79.1%)
Student Status	
1 st year/Freshman	71 (16.7%)
2 nd year/Sophomore	184 (43.3%)
3 rd year/Junior	112 (26.4%)
4 th year/Senior	58 (13.6%)
Current Pledge, New or Initiated Sorority Member	
Yes	348 (81.9%)
No	77 (18.1%)
Housing	
On-campus housing	247 (58.1%)
Off-campus housing	168 (39.5%)
I live in a sorority house	10 (2.4%)

Tobacco Product Use, Behaviors, Perceptions. Table 2 shows most (53.4%) participants used e-cigarettes every day in the past 30 days and preferred sweet-flavored e-cigarettes (54.8%). Table 3 shows over two-thirds of the sample (67.3%) reported individuals important to them viewed e-cigarettes as either *positive* or *neither positive or negative*. Additionally, nearly all (90.1%) participants reported that, of their five closest friends that used e-cigarettes, at least one friend used e-cigarettes to suppress their appetites or control their weights.

Table 2

Participant E-Cigarette Product Use and Behaviors (N = 425)

	n (%)
In the past 30 days, I have used an e-cigarette...	
Once a week	20 (4.7%)
Twice a week	41 (9.6%)
3-4 times a week	76 (17.9%)
5-6 times a week	61 (14.4%)
Every day	227 (53.4%)
E-cigarette ownership	
Yes	396 (93.2%)
No	6 (1.4%)
Missing	23 (5.4%)
Does your cigarette contain nicotine	
Yes	343 (80.7%)
No	34 (8.0%)
I don't know	48 (11.3%)
I use an e-cigarette ___ days in a typical week	
1	6 (1.4%)
2	30 (7.1%)
3	32 (7.5%)
4	43 (10.1%)
5	59 (13.9%)
6	60 (14.1%)
7	195 (45.9%)
Preferred e-cigarette flavor	
Sweet Users	233 (54.8%)
Mint	76 (17.9%)
Menthol	78 (18.4%)
Tobacco Users	38 (8.9%)

Table 3

Participant E-Cigarette Perceptions and Perceptions and Use of E-Cigarettes Among Social Influences (N = 425)

	n (%)
Thinking about the people who are important to you, how would you describe their views on using e-cigarettes?	
Very positive	45 (10.6%)
Positive	142 (33.4%)
Neither positive or negative	144 (33.9%)
Negative	71 (16.7%)
Very negative	23 (5.4%)
5 closest friends that use e-cigarettes	
0	2 (0.5%)
1	20 (4.7%)
2	81 (19.1%)
3	138 (32.5%)
4	98 (23.1%)
5	86 (20.2%)
5 closest friends that use e-cigarettes to suppress their appetites and/or to control their weight	
0	42 (9.9%)
1	80 (18.8%)
2	109 (25.6%)
3	95 (22.4%)
4	78 (18.4%)
5	21 (4.9%)
E-cigarette advertising appeals to me	
Yes	339 (79.8%)
No	86 (20.2%)

Table 4 shows almost half (44.2%) of the sample reported that they were occasional combustible cigarette users, and 83.3% reported using cigarettes in the past 30-days. Moreover, 85.6% of the sample reported *ever* using combustible cigarettes for weight control or appetite suppression, and 77.4% reported *currently* using combustible cigarettes for weight control or appetite suppression.

Table 4

Participant Combustible Cigarette Use and Behaviors (N = 425)

	n (%)
In the past 30 days, have you smoked a cigarette, even 1 or 2 puffs?	
Yes	354 (83.3%)
No	71 (16.7%)
In regard to cigarette smoking are you a ...	
Never smoker	48 (11.3%)
Former smoker	105 (24.7%)
Occasional smoker	188 (44.2%)
Regular smoker	84 (19.8%)
Have you <i>ever</i> used cigarettes to suppress your appetite and/or control your weight?	
Yes	364 (85.6%)
No	61 (14.4%)
Do you <i>currently</i> use cigarettes to suppress your appetite and/or control your weight?	
Yes	329 (77.4%)
No	35 (8.2%)
Missing	61 (14.4%)

E-Cigarette Dependence. Table 5 shows nearly half (45.4%) of the sample reported using their e-cigarette less than 15 minutes after waking up, and over half (67.5%) of the sample reported waking up at night in a typical week to use their e-cigarette. Further, over three quarters (77.6%) reported using their e-cigarettes because “it is really hard to quit,” and 90.8% reported having strong cravings to use their e-cigarettes (Figure 1). Over the past week, 83.7% of participants reported they have moderate/strong or very strong/extremely strong urges to use their e-cigarette (Figure 2).

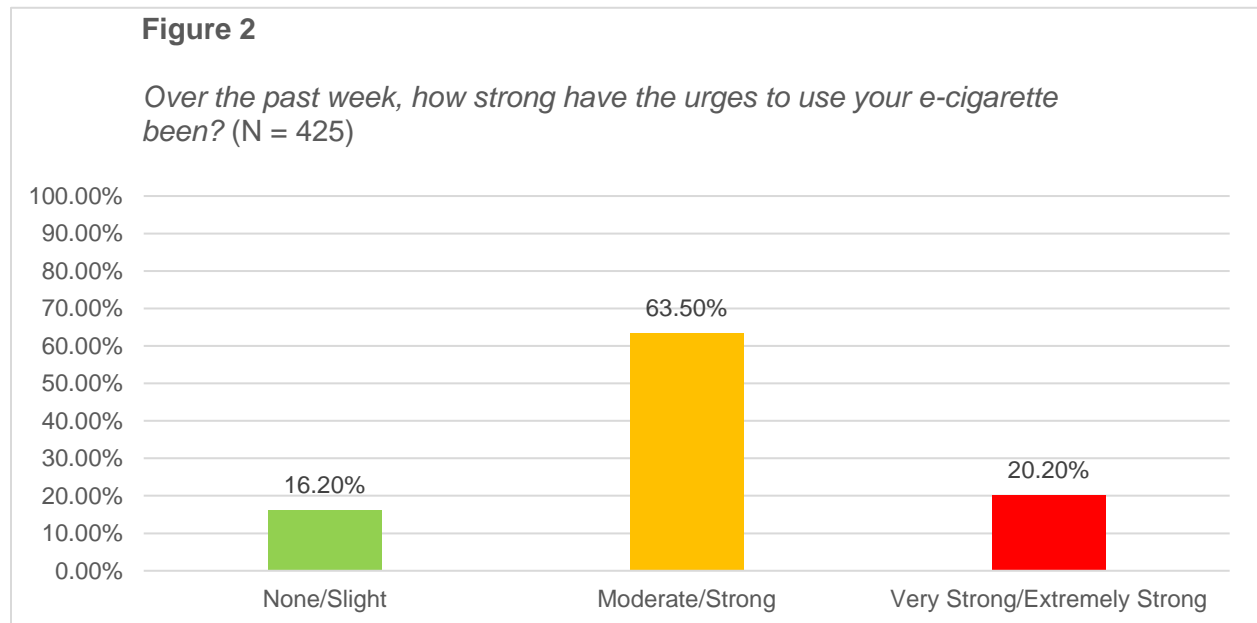
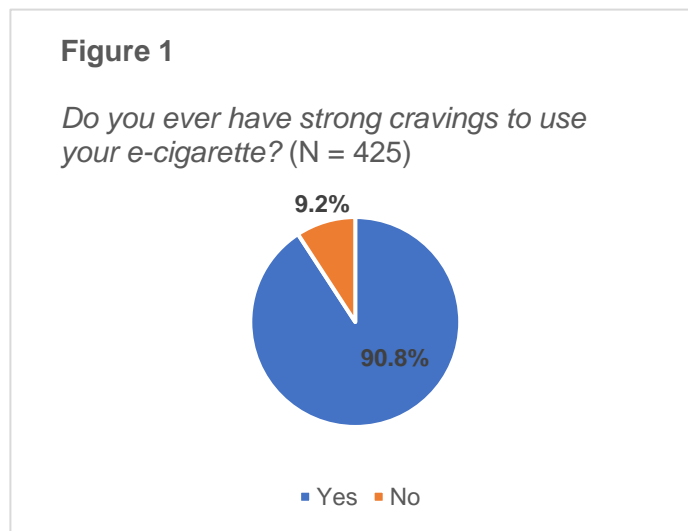


Table 5*Penn State E-Cigarette Dependence Scale (N = 425)*

	n (%)
<i>How many times a day do you usually use your e-cigarette? Assume that one "time" consists of around 15 puffs or lasts around 10 mins)</i>	
0–4 times per day	67 (15.8%)
5–9 times per day	133 (31.3%)
10–14 times per day	104 (24.5%)
15–19 times per day	73 (17.2%)
20–29 times per day	28 (6.6%)
30+ times per day	20 (4.7%)
<i>On days that you can use your e-cigarette freely, how soon after you wake up do you first use your e-cigarette?</i>	
0–5 minutes	73 (17.2%)
6–15 minutes	120 (28.2%)
16–30 minutes	115 (27.1%)
31–60 minutes	86 (20.2%)
61–120 minutes	27 (6.4%)
121+ minutes	4 (0.9%)
<i>Do you sometimes awaken at night to use your e-cigarette?</i>	
Yes	287 (67.5)
No	138 (32.5%)
<i>How many nights per week do you typically awaken to use your e-cigarette?</i>	
I do not wake up to use my e-cigarette	138 (32.5%)
0–1 night	117 (27.5%)
2–3 nights	131 (30.8%)
4+ nights	39 (9.2%)
<i>Do you use your e-cigarette now because it is really hard to quit?</i>	
Yes	330 (77.6%)
No	95 (22.4%)

Body Shape

Satisfaction. Most participants (51.3%) reported that they were *sometimes* satisfied with the shape of their body (Figure 3).

Weight

Perception. When asked about their perception of their weight, more than a third (39.8%) of participants reported having *no current weight problem* (Figure 4).

Figure 3

Body Shape Satisfaction (N = 425)

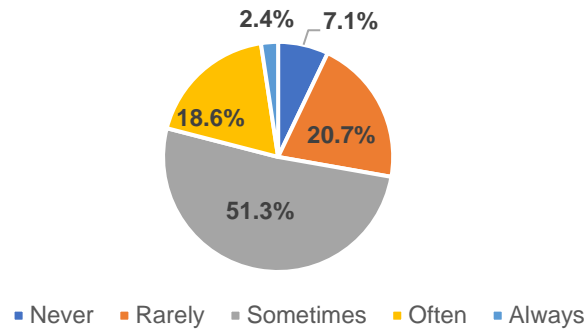
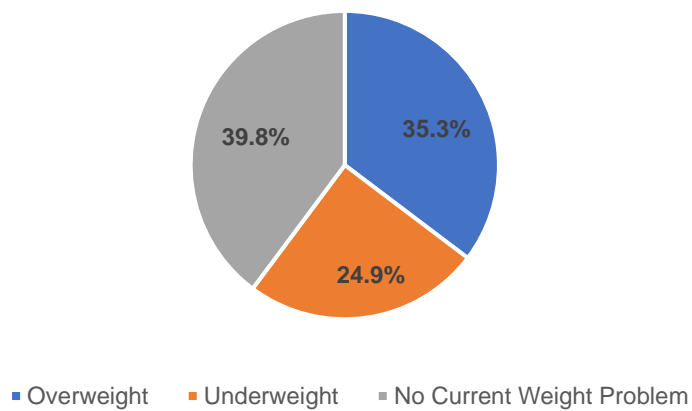
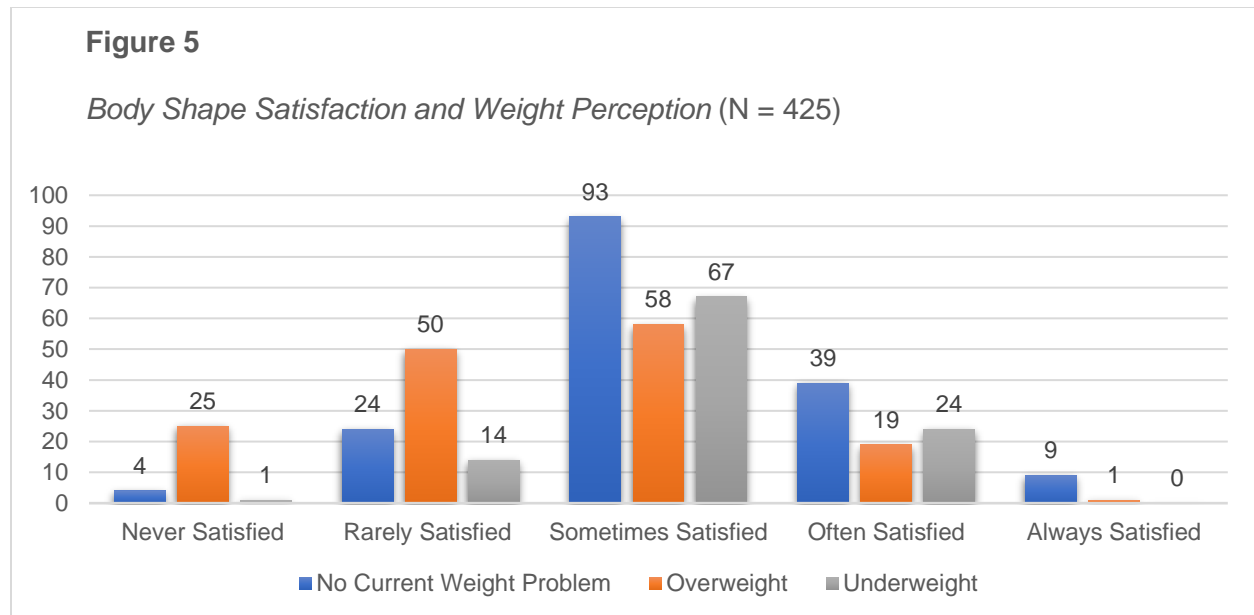


Figure 4

Weight Perception (N = 425)



Body Satisfaction and Weight Perception. Figure 5 shows the distribution among body shape satisfaction and weight perception. Participants who reported *sometimes* being satisfied (n = 218) with the shape of their body most often identified as having *no current weight problem* (n = 93, 42.7%), followed by *underweight* (n = 67, 30.7%) and *overweight* (n = 58, 26.6%).

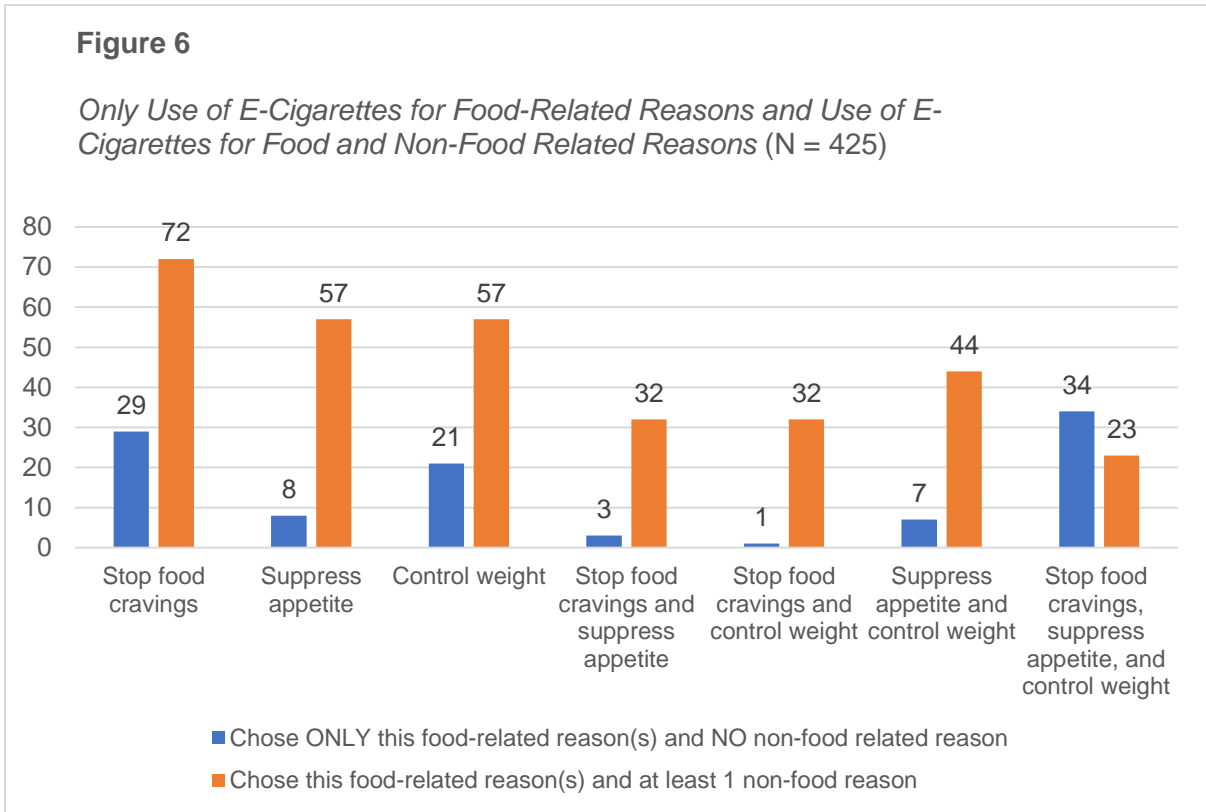


Food-Related Reasons for E-Cigarette Use. Table 6 shows a quarter (27.8%) of participants reported all three food-related reasons to describe their e-cigarette use (i.e., to stop food cravings, suppress appetite, control weight). Figure 6 shows the number of participants who exclusively chose each food-related reason and combination of food-related reasons for e-cigarette use, and the number of participants who chose at least one non-food related reasons in addition to the food reason(s) they reported. “To stop food cravings” was the most reported single given reason for e-cigarette use (n = 29, 6.8%), followed by “to control my weight” (n = 21, 4.9%). Figure 6 indicates participants were more likely to choose multiple reasons for e-cigarette use in addition to at least one food-related reason.

Table 6

Food-Related Reasons Chosen for E-Cigarette Use (N = 425)

	n (%)
1 reason reported	208 (48.9%)
2 reasons reported	99 (23.3%)
3 reasons reported	118 (27.8%)



Non-Food Related Reasons in Addition to at least One Food-Related Reason. Figure

7 shows how many participants chose a non-food related reason for e-cigarette use in addition to

at least 1

food-related

reasons for e-

cigarette use.

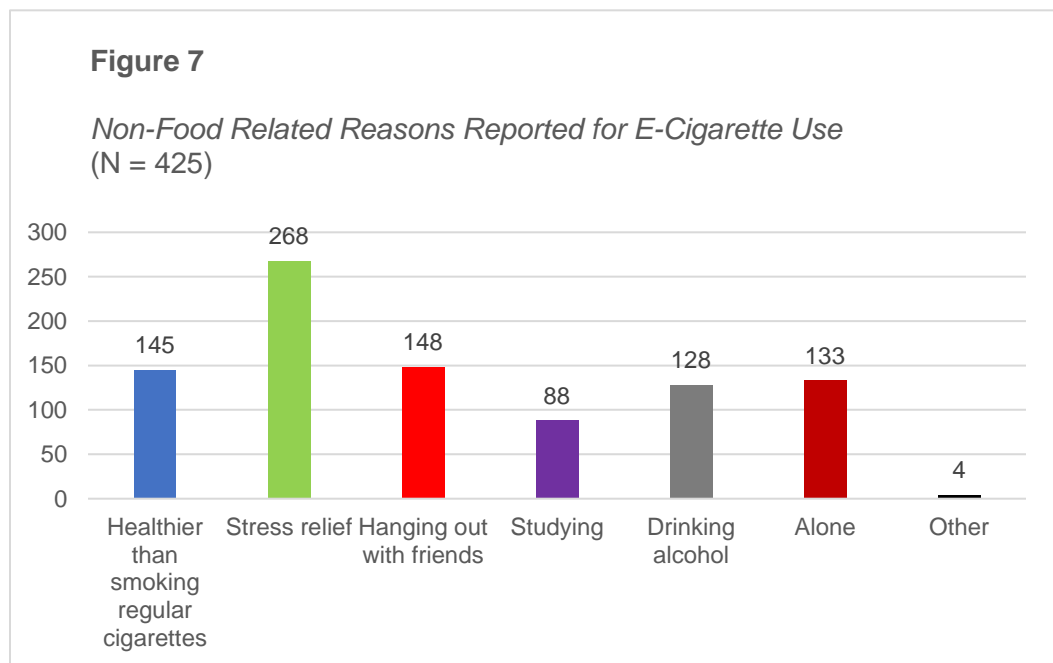
Results show

the most

reported non-

food related

reason given



was the use of e-cigarettes for stress relief (63.1%). This was followed by use when hanging out with friends (34.8%), and the belief that e-cigarettes are a healthier alternative to smoking combustible cigarettes (34.1%). Further, Table 7 shows over half (51.7%) of the sample reported two or more non-food related reasons in addition to reporting at least one food-related reason regarding their e-cigarette use.

Table 7

Non-Food Reasons Count (N = 425)

# Reported Non-Food Reasons Chosen	Count (%)
0	103 (24.2%)
1	102 (24.0%)
2	72 (16.9%)
3	32 (7.5%)
4	40 (9.4%)
5	47 (11.1%)
6	26 (6.1%)
7	3 (0.7%)

Food and Non-Food Related Reasons. Participants were able to select all that apply when reporting reasons for e-cigarette use (see Appendix A, question 4). When comparing percentages of non-food related reasons reported within each food-related reason, e-cigarette use for stress relief, hanging out with friends, and beliefs that e-cigarettes are healthier than combustible cigarettes were the most frequently reported non-food reasons for e-cigarette use (Table 8).

Table 8*Non-Food Related Reasons Reported for Each Food-Related Reason for E-Cigarette Use (N = 425)*

Food Related Reasons	Non-Food Related Reasons						
	Healthier than cigarettes	Stress relief	Hanging out with friends	Studying	Drinking alcohol	Alone	Other
Stop Food Cravings (n = 292)	110 (37.7%)	189 (64.4%)	106 (36.3%)	58 (19.9%)	89 (30.5%)	95 (32.5%)	4 (1.4%)
Suppress Appetite (n = 238)	81 (34.0%)	160 (67.2%)	93 (39.1%)	64 (26.9%)	90 (37.8%)	89 (37.4%)	3 (1.3%)
Control Weight (n = 230)	79 (34.4%)	144 (62.6%)	81 (35.2%)	50 (21.7%)	76 (33.0%)	72 (31.3%)	2 (0.9%)

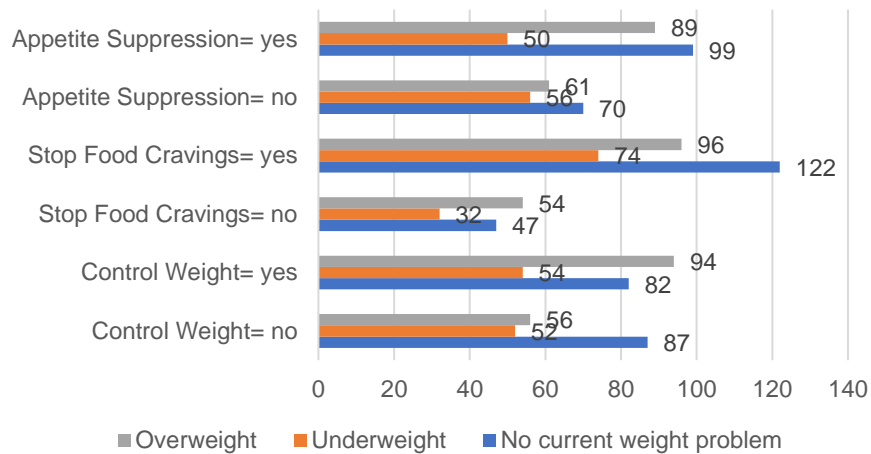
Simple Comparisons

Weight Perception and Food-Related Reasons for E-Cigarette Use. Chi-square

analyses (Table 8) show a significant relationship between **overweight** and the use of e-cigarettes to control weight ($\chi^2(1) = 6.823, p = .009$, Fisher's exact test = .011), and

Figure 8

Weight Perception and Food-Related Reasons for E-Cigarette Use (N = 425)

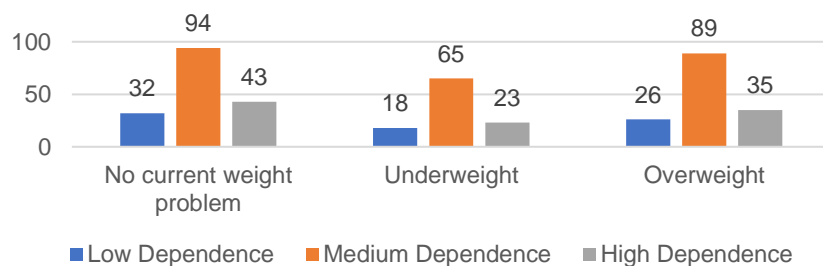


underweight and the use of e-cigarettes to suppress appetite ($\chi^2(1) = 4.469, p = .035$, Fisher's exact test = .042). All other chi-square test were not significant. Figure 8 shows the distribution of reported food-related reasons for e-cigarette use among weight perception groups.

Weight Perception and E-Cigarette Dependence. Chi-square tests (Table 9) show no significant relationships between weight perception and e-cigarette dependence. Figure 9 shows that regardless of reported weight perception, participants most often reported medium e-cigarette dependence.

Figure 9

E-Cigarette Dependence and Weight Perception (N = 425)

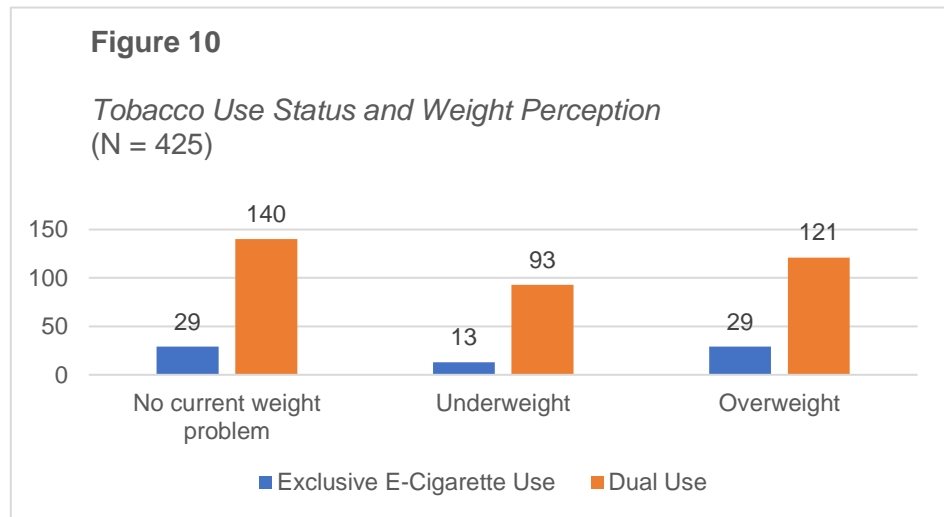


Weight Perception and Tobacco Use Status. There was not a significant relationship

between weight perception and tobacco use status (see Table 10). Figure 10 shows that

participants in each weight perception category frequently reported dual using tobacco products in the past 30 days.

Weight



Perception and E-Cigarette Frequency. A one-way ANOVA found no significant differences

in e-cigarette use days per week means based on weight perception ($F(2, 422) = 1.538, p =$

.216). Figure 11 shows each weight perception group most often reported using e-cigarettes

every day.

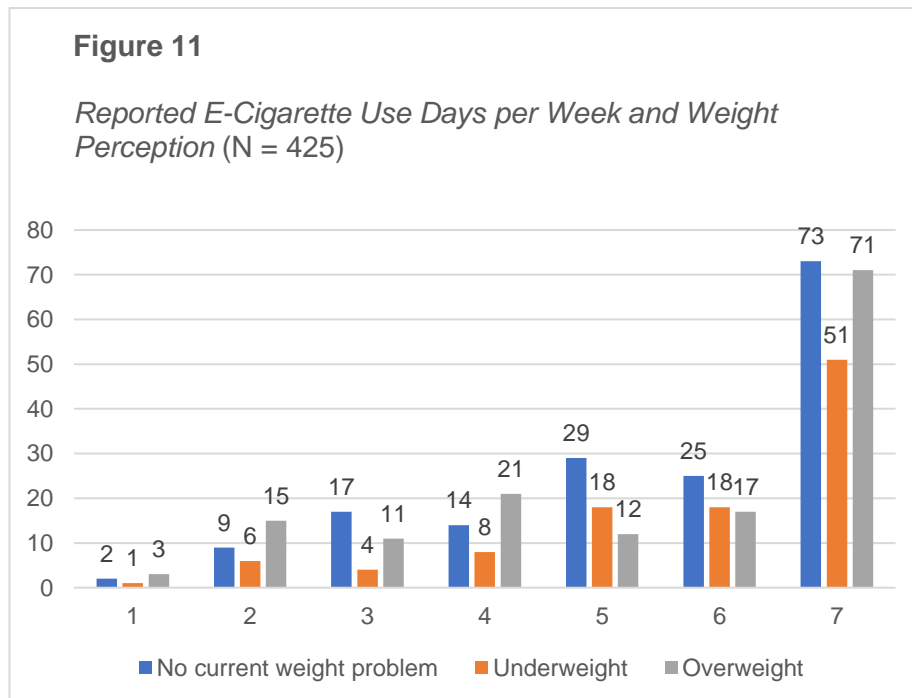


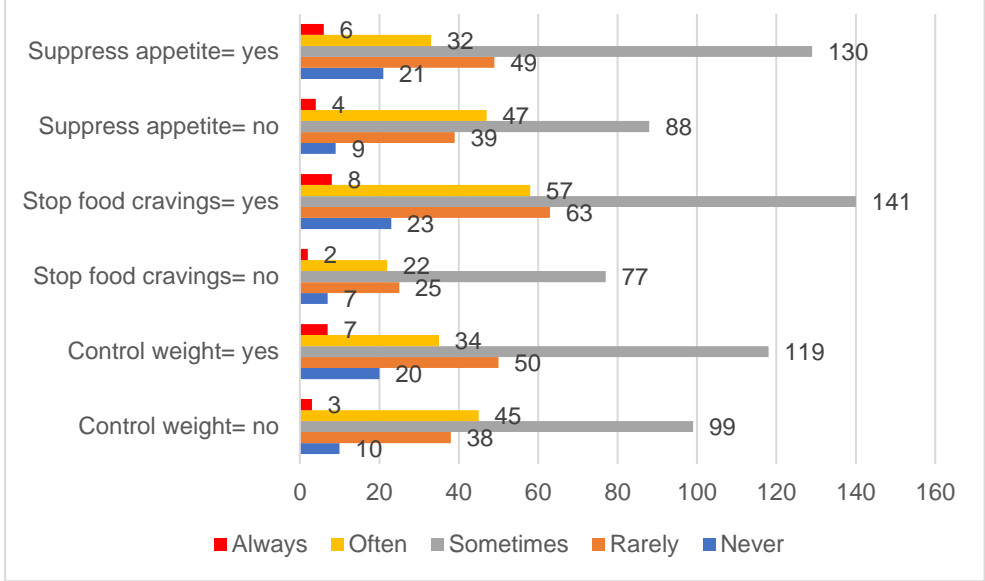
Table 9*Summary of Chi-Square Analyses using Weight Perception (N = 425)*

	No Current Weight Problem	Underweight	Overweight
E-Cigarettes to Control Weight	$\chi^2(1) = 3.540, p = .060$, Fisher's exact test = .073	$\chi^2(1) = .573, p = .449$, Fisher's exact test = .500	$\chi^2(1) = \mathbf{6.823}, p = \mathbf{.009}$, Fisher's exact test = .011
E-Cigarettes to Stop Food Cravings	$\chi^2(1) = 1.583, p = .208$, Fisher's exact test = .240	$\chi^2(1) = .080, p = .777$, Fisher's exact test = .810	$\chi^2(1) = 2.388, p = .122$, Fisher's exact test = .127
E-Cigarettes to Suppress Appetite	$\chi^2(1) = .758, p = .384$, Fisher's exact test = .425	$\chi^2(1) = \mathbf{4.469}, p = \mathbf{.035}$, Fisher's exact test = .042	$\chi^2(1) = 1.045, p = .307$, Fisher's exact test = .357
E-Cigarette Dependence	$\chi^2(2) = .865, p = .649$	$\chi^2(2) = .531, p = .767$	$\chi^2(2) = .095, p = .953$
Tobacco Use Status	$\chi^2(1) = .042, p = .839$	$\chi^2(1) = 2.002, p = .157$, Fisher's exact test = .178	$\chi^2(1) = 1.150, p = .284$

Body Shape Satisfaction and Food-Related Reasons for E-Cigarette Use. Significant relationships were found between *often* satisfied with body shape size and the use of e-cigarettes to control weight ($\chi^2(1) = 4.797, p = .029$, Fisher's exact test = .033) and *often* satisfied with body shape size the use of e-cigarettes to suppress appetite ($\chi^2(1) = 9.454, p = .002$, Fisher's exact test = .003). Figure 12 shows the distribution of reported food-related reasons for e-cigarette use among body shape satisfaction.

Figure 12

Food-Related Reasons for E-cigarette Use and Body Shape Satisfaction (N = 425)



Body Shape Satisfaction and E-Cigarette Dependence. There was not a significant relationship between body shape satisfaction and e-cigarette dependence (Table 10). Figure 13 shows the distribution of e-cigarette dependence among body shape satisfaction. Participants with medium e-cigarette dependence (n = 248) most often reported they were *sometimes* satisfied with their body shape (n = 137, 55.2%).

Body Shape Satisfaction and Tobacco Use Status. Chi-square analyses (Table 10)

show a significant relationship between dual tobacco use and *rarely* satisfied ($\chi^2(1) = 7.093, p = .008$, Fisher’s exact test = .010) and dual tobacco use and *often* satisfied ($\chi^2(1) = 7.509, p = .006$, Fisher’s exact test = .004). All other tests were not significant. Figure 14 the distribution of body shape satisfaction among exclusive e-cigarette and dual tobacco users.

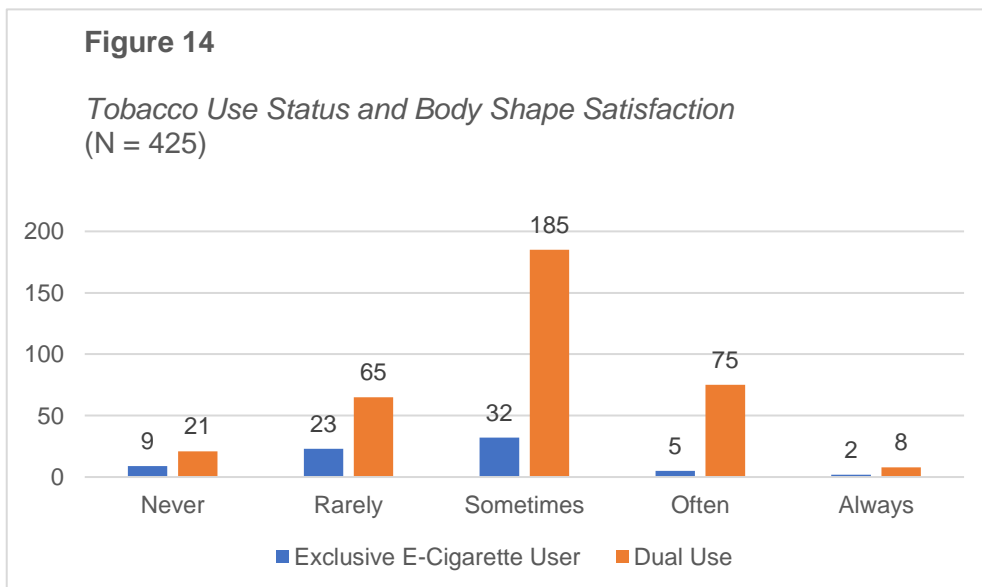
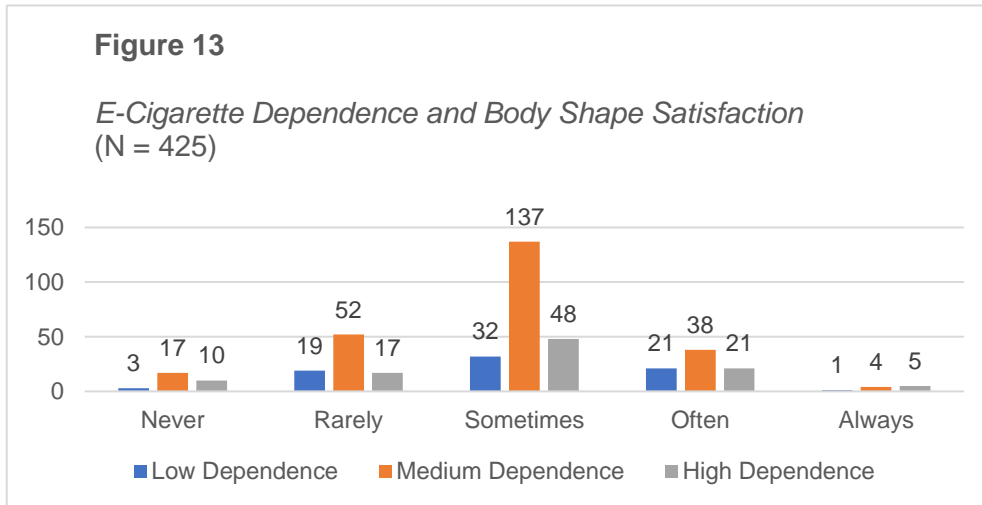


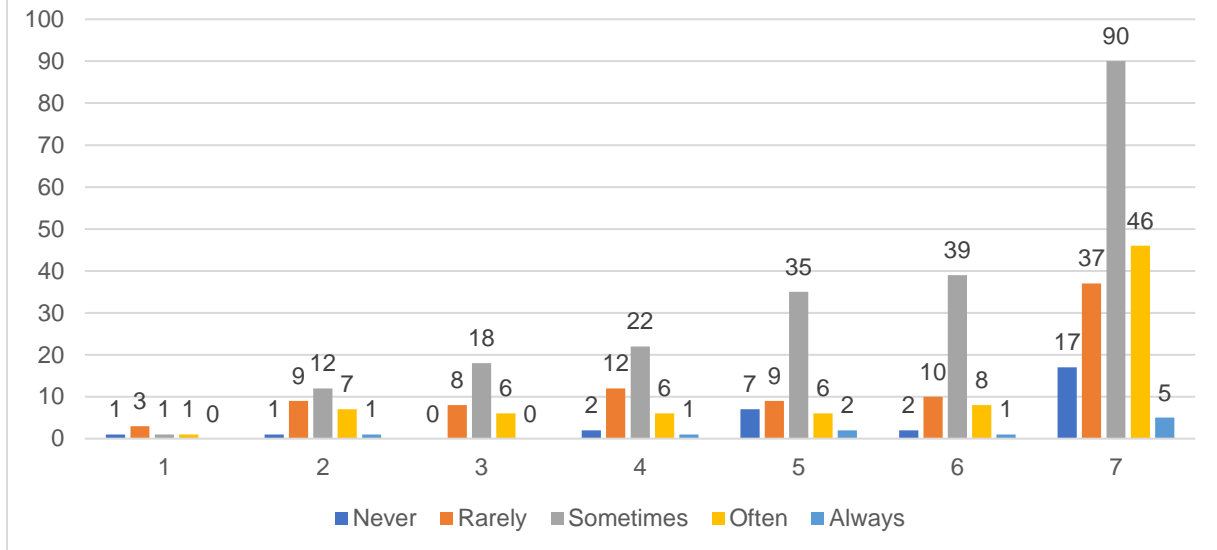
Table 10*Summary of Chi-Square Analyses using Body Shape Satisfaction (N = 425)*

	Never	Rarely	Sometimes	Often	Always
E-Cigarettes to Control Weight	$\chi^2(1) = 2.047, p = .152,$ Fisher's exact test = .185	$\chi^2(1) = .326, p = .568,$ Fisher's exact test = .631	$\chi^2(1) = .040, p = .842,$ Fisher's exact test = .846	$\chi^2(1) = 4.797, p = .029,$ Fisher's exact test = .033	$\chi^2(1) = 1.040, p = .308,$ Fisher's exact test = .355
E-Cigarettes to Stop Food Cravings	$\chi^2(1) = .951, p = .328,$ Fisher's exact test = .416	$\chi^2(1) = .430, p = .512,$ Fisher's exact test = .606	$\chi^2(1) = 3.376, p = .066,$ Fisher's exact test = .075	$\chi^2(1) = .536, p = .464,$ Fisher's exact test = .504	$\chi^2(1) = .608, p = .436,$ Fisher's exact test = .731
E-Cigarettes to Suppress Appetite	$\chi^2(1) = 2.568, p = .109,$ Fisher's exact test = .128	$\chi^2(1) = .005, p = .946,$ Fisher's exact test = 1.000	$\chi^2(1) = 2.398, p = .122,$ Fisher's exact test = .143	$\chi^2(1) = 9.454, p = .002,$ Fisher's exact test = .003	$\chi^2(1) = .066, p = .797,$ Fisher's exact test = 1.000
E-Cigarette Dependence	$\chi^2(2) = 2.381, p = .304$	$\chi^2(2) = 1.787, p = .409$	$\chi^2(2) = 4.428, p = .109$	$\chi^2(2) = 5.953, p = .051$	$\chi^2(2) = 3.913, p = .141$
Tobacco Use Status	$\chi^2(1) = 4.100, p = .043,$ Fisher's exact test = .070	$\chi^2(1) = 7.093, p = .008,$ Fisher's exact test = .010	$\chi^2(1) = 1.322, p = .250,$ Fisher's exact test = .298	$\chi^2(1) = 7.509, p = .006,$ Fisher's exact test = .004	$\chi^2(1) = .080, p = .777,$ Fisher's exact test = .676

Body Shape Satisfaction and E-Cigarette Frequency. A one-way ANOVA found no significant differences in e-cigarette use days per week by body shape satisfaction ($F(4, 420) = 1.459, p = .214$). Figure 15 shows the distribution of e-cigarette use days per week by body shape satisfaction.

Figure 15

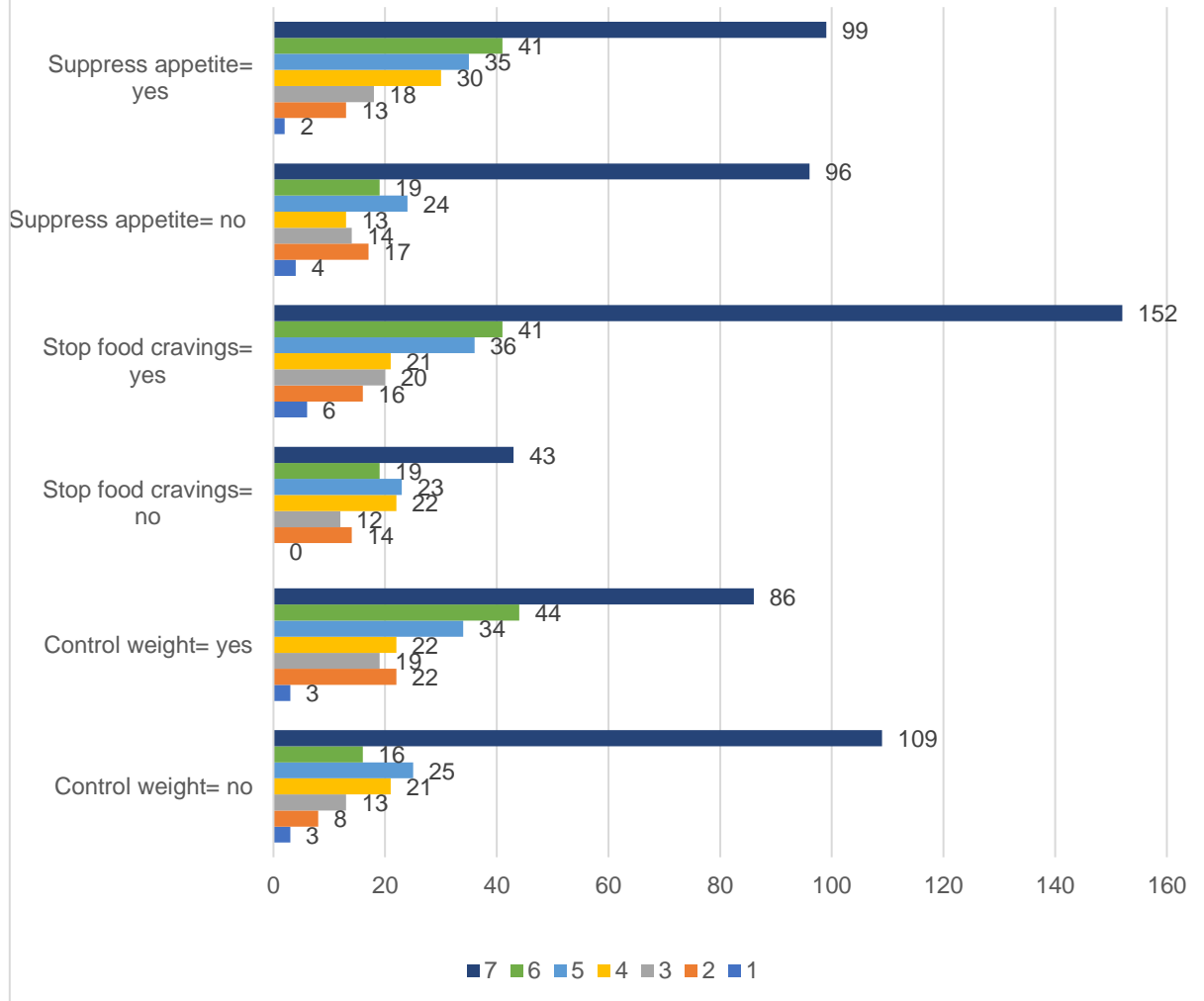
E-Cigarette Days Used per Week by Body Shape Satisfaction (N = 425)



E-Cigarette Frequency and Food-Related Reasons for E-Cigarette Use. A one-way ANOVA was used to test mean differences in e-cigarette frequency based on food-related reasons for e-cigarette use. ANOVA results found that e-cigarette use days per week was significantly different based on food-related reasons reported for e-cigarette use ($F(6, 418) = 3.039, p = .006$). Tukey's post hoc test found these significant differences occurred between the use of e-cigarettes to stop food cravings and the use of e-cigarettes to control weight ($p = .019$), and the use of e-cigarette to suppress appetite and control weight and the use of e-cigarettes to stop food cravings ($p = .041$). When analyzing the means, participants who reported using e-cigarettes to stop food cravings ($M = 5.82, SD = 1.752$) used e-cigarettes more days per week when compared to participants who reported using e-cigarettes to control their weight ($M = 4.84, SD = 1.999$), as well as participants who reported the use of e-cigarettes to suppress appetite and control weight ($M = 4.91, SD = 1.444$). Figure 16 shows the distribution of food-related reasons for e-cigarette use by e-cigarette use days per week.

Figure 16

Food-Related Reasons for E-Cigarette Use by E-Cigarette Use Days per Week (N = 425)



E-Cigarette Use Days per Week and E-Cigarette Dependence. A significant small, positive Pearson’s correlation was found when testing the relationship between e-cigarette use days per week and e-cigarette dependence ($r = .229, p = .000$). As e-cigarette use days per week increased, e-cigarette dependence increased.

E-Cigarette Use Days per Week and Tobacco Use Status.

Chi-square analyses (Table 11) show a significant relationship between e-cigarette use days per week and dual use ($\chi^2(6) = 15.790, p = .015$). All other chi-square analyses were not significant. Figure 17 shows dual users and exclusive only e-cigarette users reported everyday e-cigarette use most often.

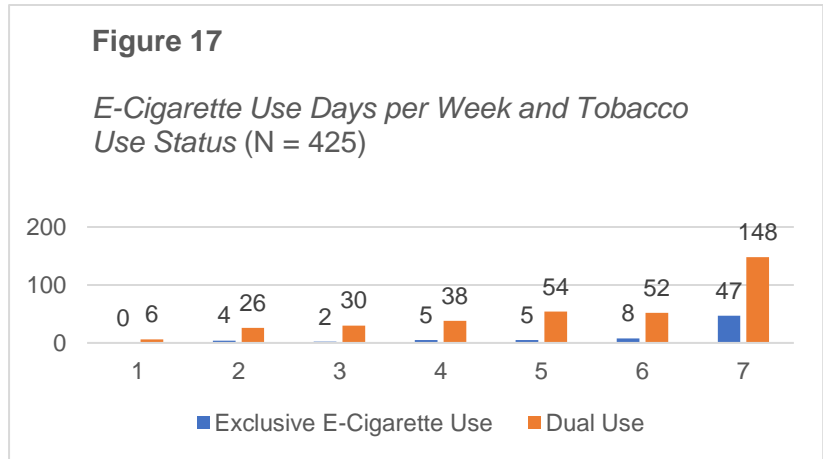
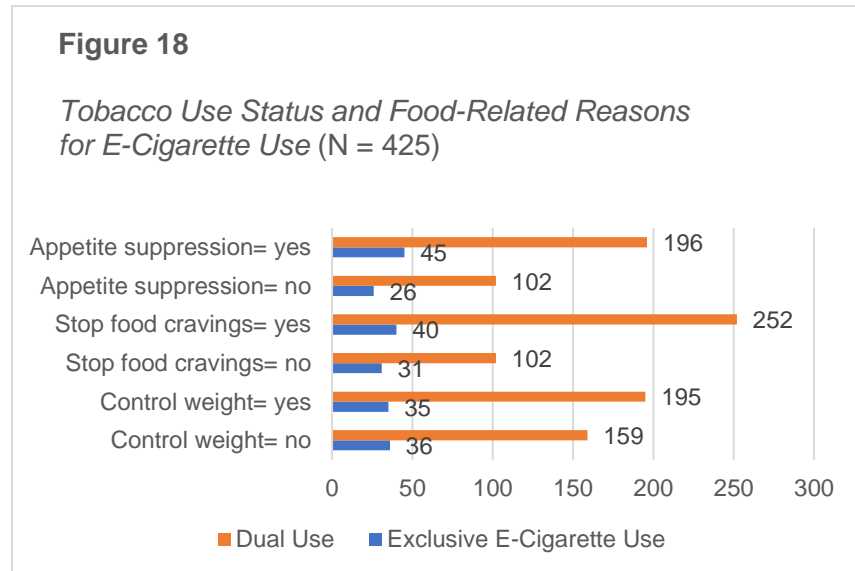


Figure 17 shows dual users and exclusive only e-cigarette users reported everyday e-cigarette use most often.

Tobacco Use Status and Food-Related Reasons for E-Cigarette Use. Chi-square analyses (Table 11) found a significant relationship between dual tobacco use and the use of e-cigarettes to stop food

cravings ($\chi^2(1) = 6.064, p = .014$, Fisher's exact test = .017). Dual users reported each food-related reason more often than e-cigarette only users (see Figure 18).

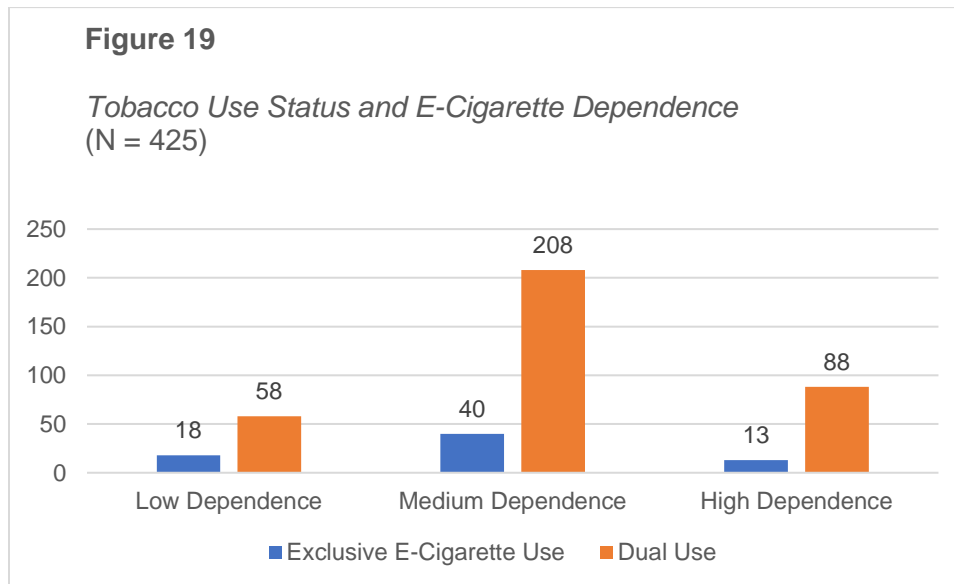


Tobacco Use Status and E-Cigarette Dependence. No significant results (Table 11) were seen in the chi-square test between tobacco use status and e-cigarette dependence ($\chi^2(2) = 3.786, p = .151$). Dual and e-cigarette only users most often reported medium e-cigarette dependence (see Figure 19).

Table 11

Summary of Chi-Square Analyses using Tobacco Use Status (N = 425)

Variable	Chi Square Results
E-Cigarettes to Control Weight	$\chi^2(1) = .798, p = .372$, Fisher's exact test = .434
E-Cigarettes to Stop Food Cravings	$\chi^2(1) = \mathbf{6.064}, p = \mathbf{.014}$, Fisher's exact test = .017
E-Cigarettes to Suppress Appetite	$\chi^2(1) = 1.884, p = .170$, Fisher's exact test = .191
E-Cigarette Dependence	$\chi^2(2) = 3.786, p = .151$



Research Question 1: Is there a relationship between weight perception and the use of e-cigarettes for weight control?

To answer research question 1, a logistic regression was performed to test associations between e-cigarette use for weight control and weight perception (see Table 12). In the unadjusted model, *overweight* was significantly associated with the use of e-cigarettes for weight control (OR = 1.781, CI = 1.138, 2.787, $p = .012$). Participants who reported *overweight* were 1.8 times more likely to use e-cigarettes for weight control when compared to participants that reported *no current weight problem*.

In the second model, after adjusting for using e-cigarettes to stop food cravings and to suppress appetite, participants who perceived themselves as *overweight* were 1.8 times more likely to report the use of e-cigarettes for weight control when compared to participants who reported *no current weight problem* (AOR = 1.800, CI = 1.121, 2.892, $p = .015$). Participants who reported the use of e-cigarettes to stop food cravings were .6 times less likely to report the use of e-cigarettes for weight control when compared to those who did not report the use of e-cigarettes to stop food craving (AOR = .612, CI = .392, .957, $p = .031$), and participants who reported the use of e-cigarettes for appetite suppression were 3.4 times more likely to report the use of e-cigarettes for weight control (AOR = 3.444, CI = 2.279, 5.205, $p = .000$) when compared to those who did not report the use of e-cigarettes for appetite suppression.

In the third model, after adjusting for e-cigarette use days per week and e-cigarette dependence, participants who reported *overweight* were 2 times more likely to report the use of e-cigarettes for weight control when compared to participants who reported *no current weight problem* (AOR = 1.989, CI = 1.201, 3.295, $p = .008$). Participants who reported the use of e-cigarettes for appetite suppression were 3.6 times more likely to report the use of e-cigarettes for weight control when compared to those who did not report the use of e-cigarettes for appetite suppression (AOR = 3.581, CI = 2.295, 5.589, $p = .000$). Finally, participants with high e-cigarette dependence were 4.7 times more likely to report using e-cigarettes for weight control when compared to participants with low e-cigarette dependence (AOR = 4.667, CI = 2.265, 9.617, $p = .000$).

The final model, adjusted for age, race, Hispanic ethnicity, sexual orientation, and sorority member status, participants who reported being *overweight* were 2.5 times more likely to report the use of e-cigarettes for weight control when compared to participants who reported

no current weight problem (AOR = 2.480, CI = 1.436, 4.281, $p = .001$), and participants who reported the use of e-cigarettes for appetite suppression were 3.3 times more likely to report the use of e-cigarettes for weight control when compared to those who did not report using e-cigarettes for appetite suppression (AOR = 3.312, CI = 2.049, 5.353, $p = .000$). Participants with high e-cigarette dependence were almost 4 times more likely to report using e-cigarettes for weight control when compared to those with low e-cigarette dependence (AOR = 3.921, CI = 1.792, 8.579, $p = .001$). American Indian/Alaska Native participants were 2.3 times more likely to report the use of e-cigarettes for weight control when compared to White participants (AOR = 2.268, CI = 1.108, 4.641, $p = .025$), Black/African American participants were 2.3 times more likely to report using e-cigarettes for weight control when compared to White participants (AOR = 2.282, CI = 1.178, 4.421, $p = .014$), and Native Hawaiian/Pacific Islander participants were 2.1 times more likely to report using e-cigarettes for weight control when compared to White participants (AOR = 7.268, CI = 2.085, 25.332, $p = .002$).

Two-way interaction effects were tested between weight perception and the variables included in the logistic regression. After adding each two-way interaction separately to model 4, three two-way interactions were found to be significant (weight perception * food cravings, weight perception * race, and weight perception * ethnicity). When the three significant two-way interactions were added to model 4, only two stayed significant (weight perception * food cravings and weight perception * race). See Table 13, Figure 20, and Figure 21 for more information regarding significant two-way interactions.

Table 12

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3	Model 4
Weight perception (Ref = No Current Weight Problem)				
Underweight	OR = 1.102 (.678, 1.791)	AOR = 1.283 (.763, 2.157)	AOR = 1.390 (.795, 2.428)	AOR = 1.530 (.827, 2.831)
Overweight	OR = 1.781 (1.138, 2.787)**	AOR = 1.800 (1.121, 2.892)*	AOR = 1.989 (1.201, 3.295)**	AOR = 2.480 (1.436, 4.281)***
Stop food cravings (Ref = No)		AOR = .612 (.392, .957)**	AOR = .659 (.406, 1.061)	AOR = .741 (.440, 1.246)
Appetite Suppression (Ref = No)		AOR = 3.444 (2.279, 5.205)***	AOR = 3.581 (2.295, 5.589)***	AOR = 3.312 (2.049, 5.353)***
E-cigarette days per week (Ref = 1 day a week)				
2 days a week			AOR = 2.403 (.355, 16.244)	AOR = 1.842 (.231, 14.724)
3 days a week			AOR = 1.314 (.202, 8.545)	AOR = 1.695 (.211, 13.614)
4 days a week			AOR = .535 (.084, 3.390)	AOR = .487 (.065, 3.669)
5 days a week			AOR = .752 (.122, 4.616)	AOR = .689 (.094, 5.061)
6 days a week			AOR = 1.473 (.237, 9.134)	AOR = 1.698 (.230, 12.517)
7 days a week			AOR = .479 (.084, 2.731)	AOR = .514 (.075, 3.520)
E-Cigarette Dependence (Ref = Low Dependence)				
Medium Dependence			AOR = 1.606 (.887, 2.907)	AOR = 1.454 (.755, 2.800)
High Dependence			AOR = 4.667 (2.265, 9.617)***	AOR = 3.921 (1.792, 8.579)***
Age				AOR = 1.093 (.963, 1.241)
Race (Ref = White)				

Table 12

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3	Model 4
AI/AN				AOR = 2.268 (1.108, 4.641)**
Asian				AOR = 1.277 (.390, 4.183)
Black/AA				AOR = 2.282 (1.178, 4.421)**
NH/PI				AOR = 7.268 (2.085, 25.332)***
Ethnicity (Ref = Non-Hispanic)				
Hispanic				AOR = .680 (.414, 1.116)
Sexual Orientation (Ref = Heterosexual)				
Gay, Lesbian, or Bisexual				AOR = .884 (.481, 1.622)
Sorority (Ref = No)				AOR = 1.531 (.828, 2.833)

*Indicates significance at <.05 level

**Indicates significance at <.01 level

*** Indicates significance at <.001 level

Table 13

Two-way interactions effects with weight perception (N = 425)

Interaction Term	Significance
Weight Perception * E-Cigarette Use to Stop Food Cravings	.008
Weight Perception * Race	.028

Figure 20

Weight Perception and E-Cigarette Use to Stop Food Cravings by E-Cigarette Use for Weight Control (N = 425)

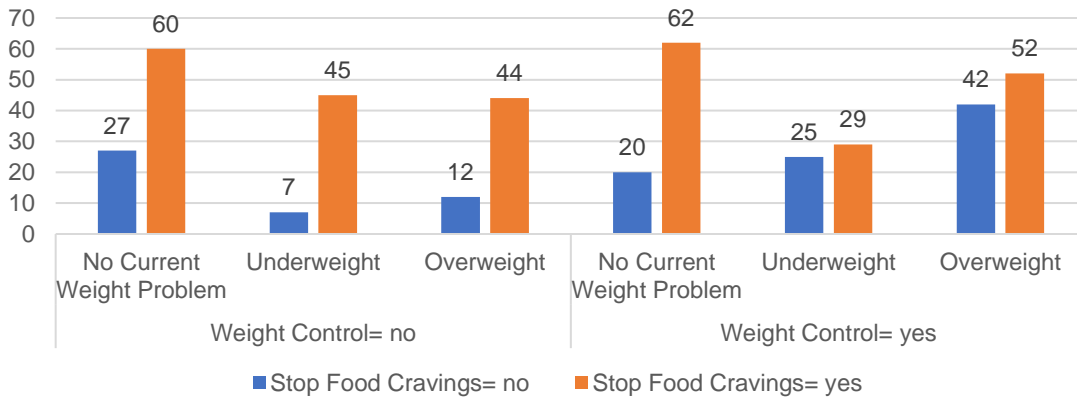
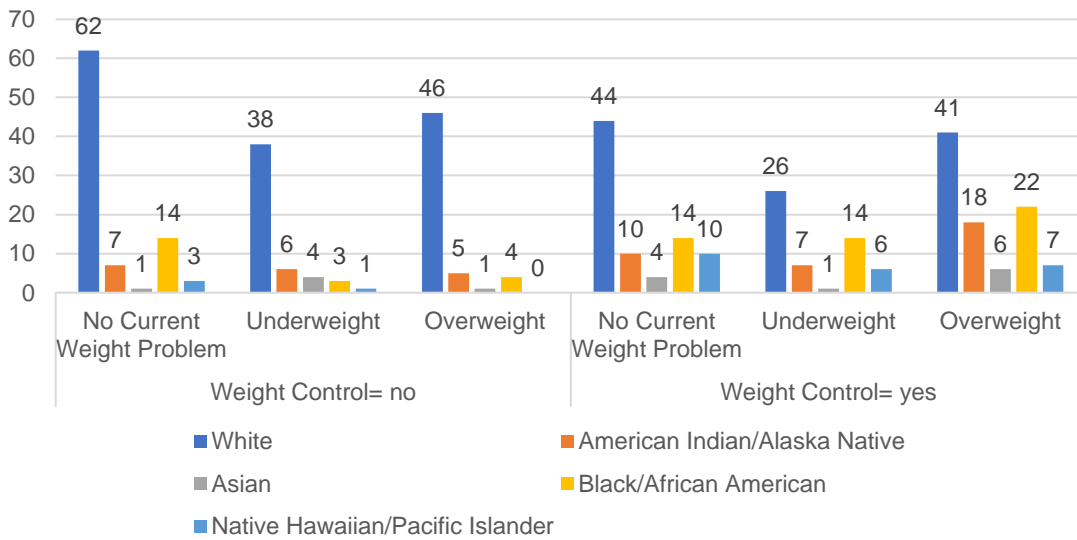


Figure 21

Weight Perception and Race by E-Cigarette Use for Weight Control (N = 425)



Research Question 2: Is there a relationship between body shape satisfaction and the use of e-cigarettes for weight control?

To answer research question 2, a logistic regression was performed to test associations between e-cigarette use for weight control and body shape satisfaction (see Table 14). In the unadjusted model (Model 1), use of e-cigarettes for weight control was not significantly associated with body shape satisfaction.

In the second model, the use of e-cigarettes to stop food cravings (AOR = .578, CI = .370, .903, $p = .016$) and the use of e-cigarettes for appetite suppression (AOR = 3.287, CI = 2.179, 4.957, $p = .000$) were significantly associated with the use of e-cigarette for weight control. Participants who reported the use of e-cigarettes to stop food cravings were .6 times less likely to use e-cigarettes for weight control when compared to participants who did not report using e-cigarettes to stop food cravings, and participants who reported the use of e-cigarettes for appetite suppression were 3.3 times more likely to use e-cigarettes for weight control when compared to participants who did not report using e-cigarettes for appetite suppression.

In the third model, e-cigarette use days per week and e-cigarette dependence were added to the model. After controlling for other food-related reasons for e-cigarette use, e-cigarette use days per week, and dependence, participants who reported using e-cigarettes for appetite suppression were 3.4 times more likely to use e-cigarettes for weight control when compared to participants who did not report using e-cigarettes for weight control (AOR = 3.402, CI = 2.186, 5.295, $p = .000$). Participants with high e-cigarette dependence were also 4.7 times more likely to use e-cigarettes for weight control when compared to those with low e-cigarette dependence (AOR = 4.681, CI = 2.270, 9.654, $p = .000$).

The final model controlled for demographics, sexual orientation, and sorority member status. Participants who reported the use of e-cigarettes for appetite suppression were 3.5 times likely to use e-cigarettes for weight control when compared to participants who did not report the use of e-cigarettes for appetite suppression (AOR = 3.450, CI = 2.174, 5.477, $p = .000$). Participants with high e-cigarette dependence were 4.1 times more likely to use e-cigarettes for weight control when compared to those with low e-cigarette dependence (AOR = 4.145, CI = 1.924, 8.928, $p = .000$). American Indian/Alaska Native participants were 2.4 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 2.388, CI = 1.175, 4.855, $p = .016$), Black/African American participants were 2.1 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 2.105, CI = 1.097, 4.039, $p = .025$), and Native Hawaiian/Pacific Islander participants were 6.5 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 6.483, CI = 1.978, 21.245, $p = .002$).

Two-way interactions between body shape satisfaction and the variables included in the logistic regression were tested but none were significant.

Table 14

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3	Model 4
Body Satisfaction (Ref = Never Satisfied)				
Rarely	OR = .658 (.276, 1.568)	AOR = .745 (.301, 1.840)	AOR = .705 (.273, 1.820)	AOR = .594 (.224, 1.571)
Sometimes	OR = .601 (.269, 1.344)	AOR = .619 (.268, 1.432)	AOR = .563 (.234, 1.352)	AOR = .413 (.164, 1.036)
Often/Always	OR = .427 (.180, 1.015)	AOR = .549 (.222, 1.358)	AOR = .509 (.196, 1.324)	AOR = .409 (.150, 1.118)
Stop food cravings (Ref = No)		AOR = .578 (.370, .903)*	AOR = .623 (.388, 1.001)	AOR = .696 (.421, 1.152)
Appetite Suppression (Ref = No)		AOR = 3.287 (2.179, 4.957)***	AOR = 3.402 (2.186, 5.295)	AOR = 3.450 (2.174, 5.477)***
E-cigarette days per week (Ref = 1 day a week)				
2 days a week			AOR = 2.672 (.400, 7.855)	AOR = 2.403 (.337, 17.149)
3 days a week			AOR = 1.327 (.207, 8.522)	AOR = 1.535 (.216, 10.916)
4 days a week			AOR = .593 (.095, 3.705)	AOR = .564 (.084, 3.772)
5 days a week			AOR = .707 (.117, 4.280)	AOR = .656 (.100, 4.290)
6 days a week			AOR = 1.531 (.249, 9.425)	AOR = 1.624 (.246, 10.748)
7 days a week			AOR = .510 (.090, 2.874)	AOR = .519 (.085, 3.151)
E-Cigarette Dependence (Ref = Low Dependence)				
Medium Dependence			AOR = 1.657 (.912, 3.009)	AOR = 1.578 (.841, 2.963)
High Dependence			AOR = 4.681 (2.270, 9.654)***	AOR = 4.145 (1.924, 8.928)***
Age				AOR = 1.091 (.961, 1.238)
Race (Ref = White)				

Table 14

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3	Model 4
AI/AN				AOR = 2.388 (1.175, 4.855)*
Asian				AOR = 1.530 (.473, 4.952)
Black/AA				AOR = 2.105 (1.097, 4.039)*
NH/PI				AOR = 6.483 (1.978, 21.245)**
Ethnicity (Ref = Non-Hispanic)				
Hispanic				AOR = .652 (.405, 1.047)
Sexual Orientation (Ref = Heterosexual)				
Gay, Lesbian, or Bisexual				AOR = .862 (.478, 1.551)
Sorority (Ref = No)				AOR = 1.577 (.868, 2.864)

*Indicates significance at <.05 level

**Indicates significance at <.01 level

*** Indicates significance at <.001 level

Research Question 3: Is there a relationship between frequency of e-cigarette use and the use of e-cigarettes for weight control?

To answer research question 3, a logistic regression was performed to test associations between e-cigarette use for weight control and e-cigarette use days per week (see Table 15). In the unadjusted model, e-cigarette use days per week was not significantly associated with the use of e-cigarettes for weight control.

In the second model, e-cigarette dependence and combustible cigarette use were added to the model. Participants with high e-cigarette dependence were 4.6 times more likely to use e-cigarettes for weight control (AOR = 4.582, CI = 2.317, 9.062, $p = .000$).

The final model adjusted for demographics, sexual orientation, and sorority member status. Participants with high e-cigarette dependence were 4 times more likely to use e-cigarettes for weight control when compared to participants with low e-cigarette dependence (AOR = 4.081, CI = 1.976, 8.429, $p = .000$). American Indian/Alaska Native participants were 2.5 times more likely to report using e-cigarettes for weight control when compared to White participants (AOR = 2.500, CI = 1.275, 4.902, $p = .008$), Black/African American participants were 2.5 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 2.466, CI = 1.321, 4.603, $p = .005$), Native Hawaiian/Pacific Islander participants were 6.5 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 6.573, CI = 2.062, 20.951, $p = .001$), and Hispanic participants were .6 times less likely to use e-cigarettes for weight control when compared to non-Hispanic participants (AOR = .621, CI = .396, .975, $p = .038$).

Two-way interaction effects between e-cigarette use days per week and the variables included in the logistic regression were added separately to the final model to test their influence in the model. Significant two-way interaction effects were seen between e-cigarette use days per week and e-cigarette dependence ($p = .032$). See Table 16 and Figure 22.

Table 15

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3
E-cigarette days per week (Ref = 1 day a week)			
2 days a week	OR = 2.750 (.458, 16.525)	AOR = 3.061 (.486, 19.294)	AOR = 2.667 (.410, 17.369)
3 days a week	OR = 1.462 (.254, 8.401)	AOR = 1.694 (.281, 10.208)	AOR = 1.932 (.304, 12.300)
4 days a week	OR = 1.048 (.190, 5.783)	AOR = 1.057 (.182, 6.143)	AOR = .954 (.159, 5.712)
5 days a week	OR = 1.360 (.253, 7.308)	AOR = 1.041 (.183, 5.931)	AOR = .948 (.159, 5.642)
6 days a week	OR = 2.750 (.503, 15.046)	AOR = 2.192 (.379, 12.675)	AOR = 2.235 (.371, 13.452)
7 days a week	OR = .789 (.155, 4.007)	AOR = .635 (.118, 3.416)	AOR = .633 (.113, 3.541)
E-Cigarette Dependence (Ref = Low Dependence)			
Medium Dependence		AOR = 1.533 (.880, 2.672)	AOR = 1.445 (.803, 2.599)
High Dependence		AOR = 4.582 (2.317, 9.062)***	AOR = 4.081 (1.976, 8.429)***
Combustible Cigarette Use (Ref = No)			
Age		AOR = .957 (.552, 1.659)	AOR = .828 (.462, 1.484)
Race (Ref = White)			
AI/AN			AOR = 2.500 (1.275, 4.902)**
Asian			AOR = 1.718 (.559, 5.281)
Black/AA			AOR = 2.466 (1.321, 4.603)**
NH/PI			AOR = 6.573 (2.062, 20.951)**
Ethnicity (Ref = Non-Hispanic)			
Hispanic			AOR = .621 (.396, .975)*
Sexual Orientation (Ref = Heterosexual)			
Gay, Lesbian, or Bisexual			AOR = 1.013 (.576, 1.782)

Table 15

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3
Sorority (Ref = No)			AOR = 1.232 (.703, 2.158)

*Indicates significance at <.05 level

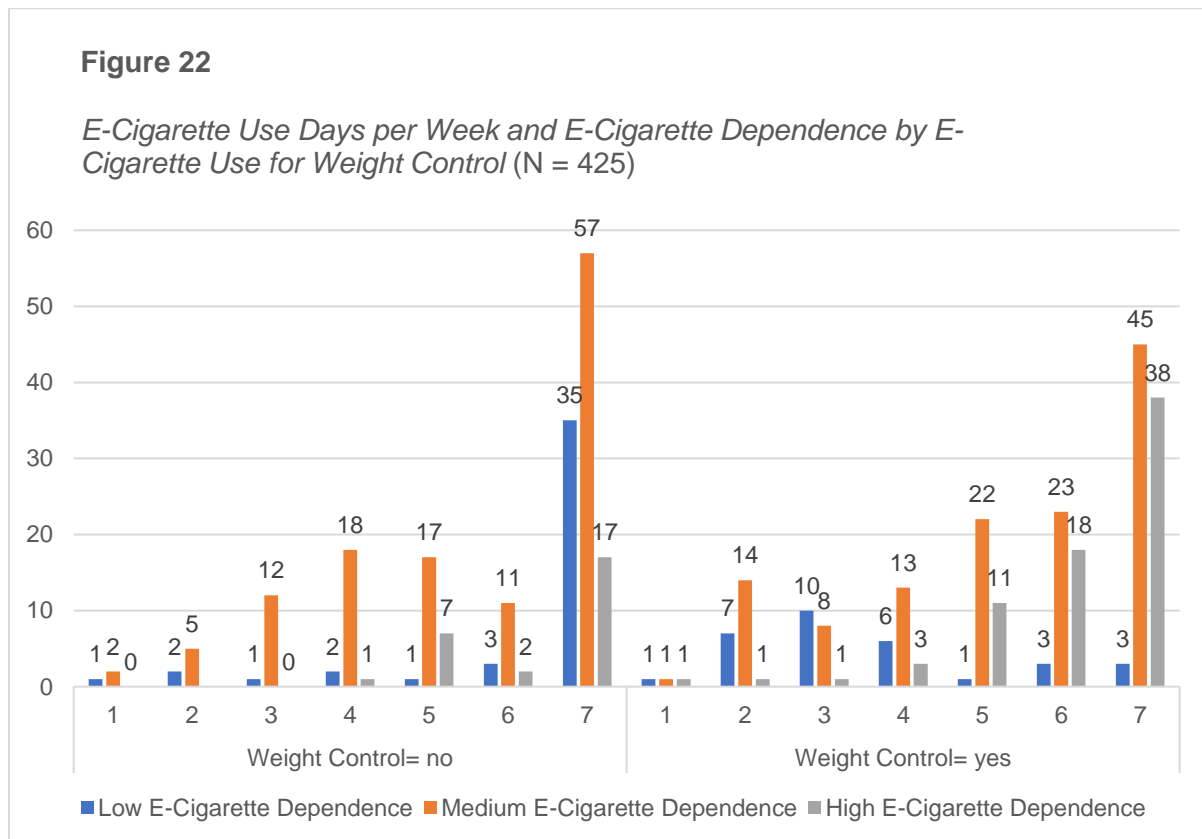
**Indicates significance at <.01 level

*** Indicates significance at <.001 level

Table 16

Two-way interactions effects with e-cigarette use days per week (N = 425)

Interaction Term	Significance
E-Cigarette Days per Week * E-Cigarette Dependence	.032



Research Question 4: Is there a relationship between tobacco use status and the use of e-cigarettes for weight control?

To answer research question 4, a logistic regression was performed to test the association between dual tobacco use and the use of e-cigarettes for weight control (see Table 17). In the unadjusted model, dual use was not significantly associated with the use of e-cigarettes for weight control.

In the second model, the use of e-cigarettes to stop food cravings (AOR = .560, CI = .357, .879, $p = .012$) and the use of e-cigarettes for appetite suppression (AOR = 3.470, CI = 2.304, 5.227, $p = .000$) were significantly associated with the use of e-cigarettes for weight control. Participants who reported the use of e-cigarettes to stop food cravings were .6 times less likely to use e-cigarettes for weight control when compared to participants who did not use e-cigarettes to stop food cravings and participants who reported the use of e-cigarettes for appetite suppression were 3.5 times more likely to use e-cigarettes for weight control when compared to participants who did not use e-cigarettes for appetite suppression.

In the third model, e-cigarette use days per week and e-cigarette dependence were added to the model. After controlling for other food-related reasons for e-cigarette use, days used per week, and dependence, participants who reported using e-cigarettes for appetite suppression were 3.6 times more likely to use e-cigarettes for weight control when compared to participants who did not report the use of e-cigarettes for appetite suppression (AOR = 3.552, CI = 2.289, 5.509, $p = .000$) and participants with high e-cigarette dependence were 4.6 times more likely to use e-cigarettes for weight control when compared to participants who had low e-cigarette dependence (AOR = 4.559, CI = 2.215, 9.385, $p = .000$).

The final model controlled for demographics, sexual orientation, and sorority member status. Participants who reported the use of e-cigarettes for appetite suppression were 3.5 times more likely to use e-cigarettes for weight control when compared to those who did not use e-cigarettes for appetite suppression (AOR = 3.547, CI = 2.247, 5.600, $p = .000$). Participants with high e-cigarette dependence were also 4.1 times more likely to use e-cigarettes for weight control when compared to participants with low e-cigarette dependence (AOR = 4.148, CI = 1.938, 8.879, $p = .000$). American Indian/Alaska Native participants were 2.3 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 2.333, CI = 1.143, 4.764, $p = .020$), Black/African American participants were 2 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 2.046, CI = 1.066, 3.927, $p = .031$), and Native Hawaiian/Pacific Islander participants were 5.9 times more likely to use e-cigarettes for weight control when compared to White participants (AOR = 5.887, CI = 1.791, 19.354, $p = .004$).

Two-way interaction effects were tested between tobacco use status and the variables included in the logistic regression. No two-way interaction effects were significant.

Table 17

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3	Model 4
Dual Use (Ref = No)	OR = 1.261 (.757, 2.101)	AOR = 1.593 (.922, 2.754)	AOR = 1.232 (.690, 2.200)	AOR = 1.037 (.564, 1.907)
Stop Food Cravings (Ref = No)		AOR = .560 (.357, .879)*	AOR = .621 (.385, 1.001)	AOR = .735 (.444, 1.216)
Appetite Suppression (Ref = No)		AOR = 3.470 (2.304, 5.227)***	AOR = 3.552 (2.289, 5.509)***	AOR = 3.547 (2.247, 5.600)***
E-cigarette days per week (Ref = 1 day a week)				
2 days a week			AOR = 2.413 (.364, 15.988)	AOR = 2.110 (.302, 14.765)
3 days a week			AOR = 1.135 (.180, 7.171)	AOR = 1.253 (.182, 8.642)
4 days a week			AOR = .535 (.087, 3.302)	AOR = .485 (.074, 3.154)
5 days a week			AOR = .642 (.107, 3.838)	AOR = .581 (.091, 3.716)
6 days a week			AOR = 1.364 (.225, 8.265)	AOR = 1.352 (.210, 8.695)
7 days a week			AOR = .476 (.085, 2.661)	AOR = .455 (.076, 2.704)
E-Cigarette Dependence (Ref = Low Dependence)				
Medium Dependence			AOR = 1.640 (.909, 2.959)	AOR = 1.574 (.847, 2.926)
High Dependence			AOR = 4.559 (2.215, 9.385)***	AOR = 4.148 (1.938, 8.879)***
Age				AOR = 1.087 (.959, 1.231)
Race (Ref = White)				
AI/AN				AOR = 2.333 (1.143, 4.764)*
Asian				AOR = 1.547 (.483, 4.956)
Black/AA				AOR = 2.046 (1.066, 3.927)*

Table 17

Summary of Logistic Regression Analysis for Variables Associated with E-Cigarette Use for Weight Control (N = 425)

	Model 1	Model 2	Model 3	Model 4
NH/PI				AOR = 5.887 (1.791, 19.354)**
Ethnicity (Ref = Non-Hispanic)				
Hispanic				AOR = .652 (.406, 1.047)
Sexual Orientation (Ref = Heterosexual)				
Gay, Lesbian, or Bisexual				AOR = .951 (.533, 1.699)
Sorority (Ref = No)				AOR = 1.373 (.769, 2.450)

*Indicates significance at <.05 level

**Indicates significance at <.01 level

*** Indicates significance at <.001 level

CHAPTER 5: DISCUSSION

Introduction

With e-cigarette rates highest among young adults in the US (Mirbolouk et al., 2018; Park-Lee et al., 2021; Villarroel et al., 2020), more research has been called on to understand young adults' reasons and expectancies for using e-cigarette (Correa et al., 2019; Pokhrel et al., 2020). Due to the appetite suppressing effects of nicotine (Audrain-McGovern & Benowitz, 2011; Cepeda-Benito, 2020; Chiolero et al., 2008) and existing evidence of combustible cigarette use for weight control purposes among women (Audrain-McGovern & Benowitz, 2011; Bloom et al., 2019; French & Perry, 1996; French et al, 1994; Pinto et al., 1999; White, 2012), it is not surprising that some e-cigarette users, particularly women, report a using e-cigarettes for weight control reasons (Farris et al., 2018; Morean & Wedel, 2017; Piñeiro et al., 2016). As a recent study (Pokhrel et al., 2020) identified college women struggling with negative body esteem as a vulnerable population to using e-cigarettes for weight control reasons, the current study sought to explore reasons for e-cigarettes use for weight control and potential influential factors to this behavior, such as body shape satisfaction and weight perception among college women. Unhealthy weight control strategies can pose numerous risks to overall health (French et al., 1995; Haynes et al., 2018; Neumark-Sztainer et al., 2011; Striegel-Moore & Bulik, 2007). While we do not know the long-term health effects associated with e-cigarette use, we do know that e-cigarettes are not without harm (National Academics of Sciences, Engineering, and Medicine [NASEM], 2018). Understanding why individuals decide to use e-cigarettes for weight control purposes is a necessary step in preventing this behavior.

Significance of Research

Participant reports of e-cigarette use to control weight, to stop food cravings and/or to suppress appetite support previous studies showing that some college women use e-cigarettes for weight control purposes (Bennett & Pokhrel et al., 2018; Pokhrel et al., 2020). Further, results from this study showed that some college women used e-cigarettes for weight control purposes and no other reasons. As e-cigarettes were created to be used for combustible cigarette cessation, it is important to understand why college women use e-cigarettes for weight control purposes. E-cigarettes deliver the most addictive form of nicotine (i.e., aerosols containing highly oxidizing free-based nicotine; Goel et al., 2015); thus, college women who use e-cigarettes with weight control intentions are subsequently susceptible to nicotine addiction and potentially transitioning and/or dual using tobacco products (Buckner et al., 2021; Glasser et al., 2019).

Weight Perception and E-Cigarette Use for Weight Control

To answer the question is there a relationship between weight perception and the use of e-cigarettes for weight control, logistic regression findings provided evidence of a significant association between overweight and the use of e-cigarettes for weight control among college women. These results align with previous research that shows individuals who perceive themselves as overweight are more likely to attempt weight loss using both healthy and unhealthy weight control strategies (Haynes et al., 2018). These findings also align with e-cigarette research that found e-cigarette users who report being overweight are more likely to use e-cigarettes to lose or control their weight (Bennett & Pokhrel, 2018; Morean & Wedel, 2017). Though the findings among perceived overweight are consistent with previous literature, significant findings among perceived underweight and the use of e-cigarettes to suppress appetite also adds to our knowledge of e-cigarette use for weight control among college women.

The significant relationship between perceived underweight and the use of e-cigarettes for appetite suppression aligns with previous research conducted among college dual users (Napolitano et al., 2020) where a significant inverse correlation was seen between BMI and reported weight concerns. The authors suggest these results indicate that participants with lower BMI's may be using tobacco products to control appetite and weight. The current study findings also align with clinical research. Women with the eating disorder anorexia nervosa, which is characterized by weight loss, tend to restrict their caloric intake as well as the kinds of foods they eat (National Eating Disordered Association [NEDA], 2018); thus, those who reported being underweight and use e-cigarettes for appetite suppression may have an underlying eating disorder that fuels this behavior, although participants were not asked whether they engage in eating disorder behaviors or if they had been clinically diagnosed with an eating disorder. Additionally, any individual regardless of body size can also have anorexia but may be less likely to be diagnosed due to weight stigma (NEDA, 2018). As e-cigarette users with a self-reported eating disorder have been seen to report e-cigarette use for weight loss (Morean & L'Insalata, 2017), identifying differences in e-cigarette use and reasons for use among individuals with and without eating disorders will allow researchers to better understand how weight perception plays a role in the use of e-cigarettes for weight control.

Although a recent study (Wilson et al., 2021) found the majority (62.6%) of female college students correctly perceived their weight, a considerable amount (31.2%) who were underweight or normal weight perceived themselves as overweight. Previous findings suggest inaccurate weight perceptions are common among college women (Harring et al., 2010; Rote et al., 2015) and may be a result of viewing an underweight body type as an ideal body type (MacNeil & Best, 2015; Wu et al., 2021), therefore overestimating their own weight. Findings

from this study may support research that indicates internalization of society's thin ideal can produce body dissatisfaction and weight concerns in college women (Couch et al., 2016; Smolak & Levine, 1996; Thompson & Stice, 2002; Zucker et al., 2001), of which are known to influence e-cigarette use for weight control (Bornioli et al., 2019; Howe et al., 2017; Mantey et al., 2020; Morean & Wedel, 2017; Pokhrel et al., 2020). As this study did not measure BMI and internalization of society's thin ideal, thus cannot measure the accuracy of reported weight perception or influence of society's thin ideal, further investigation is needed to understand if college women are accurately perceiving their weight, their perception of a healthy body size/weight, and if their weight perception is motivating their use of e-cigarettes for weight control. With results that showed more than a third (39.8%) of the study sample reported having no current weight problem, it is important to explore if these individuals perceive e-cigarette use as an effective way to control their weight (Pokhrel et al., 2020), as well as the reasons and influences behind their e-cigarette use for weight control to prevent this behavior.

Body Shape Satisfaction and E-Cigarette Use for Weight Control

Logistic regression results showed body shape satisfaction was not associated with the use of e-cigarettes for weight control. These results differ from the Pokhrel et al (2020) findings which suggest college women with lower body satisfaction are at an increased risk for using e-cigarettes for weight-control purposes. Similarly, research found young adult e-cigarette users who report using e-cigarettes for weight and appetite regulation had lower body image satisfaction (Napolitano et al., 2020). The inconsistencies between findings may have occurred due differences in study designs and aims. Pokhrel et al. (2020) was a longitudinal study that collected self-reported data regarding participants' e-cigarette weight control outcome expectancies at three different time points (Pokhrel et al., 2018; Pokhrel et al., 2015), and

Napolitano et al.'s (2020) cross-sectional study involved young adult non-tobacco users, ever cigarette users, dual users, and ever e-cigarette users and their perceptions related to e-cigarette use (i.e., flavors, stress reduction, appetite regulation, body image, and weight control). A question that still needs to be addressed is if college women who use e-cigarettes for weight control purposes and who are often satisfied with their body shape attribute their body satisfaction to using e-cigarettes for weight control. The next step for clinical research is to test if e-cigarette users are successfully suppressing their appetite and controlling their weight with e-cigarette use.

Frequency of E-Cigarette Use and E-Cigarette Use for Weight Control

E-cigarette days used per week was not associated with e-cigarette use for weight control. These results differ from previous research that found that weight concerns were associated with greater e-cigarette use frequency among young adults (Bennett & Pokhrel, 2018). Differences in e-cigarette frequency and weight concern measures may help to explain the differences in findings between the two studies. The current study measured e-cigarette frequency with the question, "I usually use an e-cigarette ___ days in a typical week" with answer options 1–7 days a week. Bennett & Pokhrel (2018) measured e-cigarette use with the question, "How often, if at all, do you currently use an e-cigarette?" with answer options "daily", "less than daily, but at least once a week", "less than weekly, but at least once a month", "less than monthly", "not at all." Also, Bennett & Pokhrel (2018) measured weight concerns using the Stanford Weight Concerns Scale (Killen et al., 1994); the current study did not measure weight concerns rather considered reports of e-cigarette use to control weight, stop food cravings, and/or to suppress appetite to be behavioral aspects related to weight concerns. Future research should measure weight concerns using a validated scale as well as ask participants to report the reasons they use

e-cigarettes to further investigate the relationship between e-cigarette use frequency and e-cigarette use to control weight.

Though frequency of e-cigarette use was not significantly associated with e-cigarette use for weight control, 60% of the sample reported using e-cigarettes 6 or 7 days in a typical week. These results differ from previous e-cigarette research that suggests negative body esteem leads to increased e-cigarette use (Pokhrel et al., 2020), though they support combustible cigarettes research that suggests women who smoke with weight control outcome expectancies have higher cigarette use. The current study results may indicate that participants are finding success in controlling their weight with increased e-cigarette use, though more research is needed to test this relationship. On the other hand, being that participants reported multiple reasons for e-cigarette use, including non-food related reasons, results may also indicate that e-cigarette use for weight control is not influencing e-cigarette frequency as much as other reasons for e-cigarette use.

Further, a one-way ANOVA test showed participants who reported using e-cigarettes to stop food cravings significantly used e-cigarettes more days per week when compared to those who reported using to control their weight and those who reported the combined reasons of e-cigarette use to suppress appetite and control weight. These results align with previous research that positive outcome expectancies for e-cigarette use are associated with greater frequency of e-cigarette use among young adults (Correa et al., 2019) and other research that found young adults with higher weight concerns used e-cigarettes at higher frequencies (Bennett & Pokhrel 2018; Napolitano et al., 2020; Pokhrel et al., 2020). Thus, participants who report e-cigarette use to stop food cravings may have greater positive outcome expectancies for using e-cigarettes in this manner, as well as greater weight concerns when compared to e-cigarette users that use for

weight control and appetite suppression. Future research should measure differences in weight concerns and reasons for e-cigarette use to understand how these may influence frequency of e-cigarette use in weight control motivated e-cigarette users.

Tobacco Use Status and E-Cigarette Use for Weight Control

Tobacco use status was not significantly associated with the use of e-cigarettes for weight control. A recent study (Buckner et al., 2021) among young adults found dual users who initiated their tobacco use with e-cigarettes had significantly greater weight control expectancies for e-cigarette use when compared to dual users who initiated their tobacco use with combustible cigarettes, thus it was expected e-cigarette only use would be significantly associated with e-cigarette use for weight control. Non-significant findings may have occurred due to a lack of data collected on participants experiences and expectancies attributed to tobacco products for weight control. Future studies should aim to collect data related to first time tobacco exposure, weight control expectancies, behavioral intentions, and other reasons for use to see how these factors influence tobacco use status and the use of e-cigarettes for weight control.

Though no significant association was seen between tobacco use status and e-cigarette use for weight control, chi-square results found a significant relationship between tobacco use status and e-cigarette use to stop food cravings. Dual users reported e-cigarette use to stop food cravings significantly more than exclusive e-cigarette users. These results support previous findings that current daily combustible cigarette smokers were more likely to report current e-cigarette use if they had a stronger tendency to use combustible cigarettes to suppress their appetite and/or prevent overeating (Bloom et al., 2019). Additionally, chi-square results found a significant relationship between dual tobacco use and e-cigarette use frequency.

Significant results among dual tobacco use and e-cigarette use frequency in this study support concerns that weight concerns may influence higher intensity of e-cigarette use among users (Bennett & Pokhrel, 2018), as well as concerns that e-cigarette users may transition to or dual use tobacco products to maximize the pharmacological effects of nicotine consumption, such as appetite suppression and increased metabolism, in order to achieve weight control (Audrain-McGovern & Benowitz, 2011; Bloom et al., 2019; Buckner et al., 2021; Chiolero et al., 2008). For example, over three-fourths (77.4%) of the sample reported currently using combustible cigarettes for weight control or appetite suppression. On the other hand, there is a possibility that some college women who dual use tobacco products are using e-cigarettes not only for weight control, but to avoid post-cessation weight gain (Dobbie et al., 2020; Jackson et al., 2019; Russo et al., 2018). As a recent study (Peltier et al., 2019) among college students found e-cigarette use was a negative predictor of past combustible quit attempts, indicating college students were not using e-cigarettes to quit combustible cigarette use, future research should measure first time tobacco exposure, reasons for e-cigarette use for weight control, and weight control expectancies of tobacco use to help address concerns that e-cigarette use for weight control may lead to transitioned and/or dual use (Bloom et al., 2019; Buckner et al., 2021).

Additional Significant Findings

Logistic regression results also found significant associations between the use of e-cigarettes for weight control and e-cigarette use for appetite suppression, e-cigarette dependence, and race/ethnicity. Participants who reported e-cigarette use for appetite suppression were more likely to use e-cigarettes for weight control when compared to participants who did not report using e-cigarettes for appetite suppression. This aligns with previous research that shows young

adults report greater weight control expectancies for e-cigarette use (Buckner et al., 2021), as well as findings that women who smoke combustible cigarettes to lose weight or control appetite may switch to using e-cigarettes for the same purposes (Pokhrel et al., 2020). Participants with high e-cigarette dependence were also more likely to use e-cigarettes for weight control when compared to participants with low e-cigarette dependence. As e-cigarette dependency is indicative of e-cigarette use frequency (i.e., higher frequency of use leads to greater e-cigarette dependence), significant results among high e-cigarette dependence users align with previous research that weight concerns among college students may lead to increased use of e-cigarettes for weight control (Bennett & Pokhrel, 2018), though future studies should explore how weight control expectancies contributing to e-cigarette dependence.

Results also showed AI/AN, B/AA and NH/PI participants were more likely to report using e-cigarettes for weight control when compared to White participants, and Hispanic participants were less likely to use e-cigarette for weight control when compared to non-Hispanic participants. Cultural differences may help to explain the significant findings among race and ethnicity. Black women have higher prevalence of obesity (Hendley et al., 2011), and both Black women and Hispanic women are more satisfied with a larger body image when compared to non-Hispanic White women (Cadwell et al., 1997; Dorsey et al., 2009). Pokhrel et al. (2020) found that higher weight concerns were correlated with higher BMI, and NH/PI ethnicity was positively associated with BMI. Thus, NH/PI college women with high BMI's may be at risk to using e-cigarettes for weight control purposes. Additionally, Rhoades et al. (2019) study found nearly half of American Indian tobacco users did not perceive e-cigarette use as a way to control their weight. Further, previous combustible cigarette research (Fulkerson & French, 2003) among adolescents found Black female combustible cigarettes smokers to be half as likely to smoke

cigarettes to lose or control weight when compared to White female smokers, and females of mixed race were significantly more likely to smoke to lose or control weight when compared to White female smokers. The current study findings differ from previous research, though they may also indicate the power of society's thin ideal in determining one's body shape satisfaction (Vartanian & Dey, 2013) and the use of e-cigarettes for weight control. Differences in findings may have occurred due to differences in study populations and a lack of a diverse sample as more than half the sample reported being of White race (60.5%); hence future research is needed to investigate the relationship between race and cultural standards of body shape size in order to understand how these may influence e-cigarette use for weight control.

Implications for Research

The current study findings have several implications for health promotion research. First, research is needed to understand how college women use e-cigarettes in relation to device, flavor, and nicotine concentration preferences to help understand how e-cigarettes are being used for weight control (Pokhrel et al., 2020). Second, research is needed to understand the role e-cigarette marketing plays in this behavior, and whether messages being disseminated are directly or indirectly influencing college women's use of e-cigarettes for weight control (Pokhrel et al., 2020; Singh et al., 2018). Further, as the study found those who were often satisfied with their body shape were more likely to report use for appetite suppression and weight control, future longitudinal research should be conducted to evaluate users' success in controlling, losing, or maintaining weight as an outcome of this behavior (Pokhrel et al., 2020). If users are achieving weight control when using e-cigarettes, e-cigarettes may be increasingly adopted by combustible cigarette users, especially women combustible cigarette users who fear gaining weight as a result of ending combustible cigarette use (Dobbie et al., 2020; Pokhrel et al., 2020), as well as college

women with higher weight concerns and body dissatisfaction (Bennett & Pokhrel, 2018; Pokhrel et al., 2020). Lastly, based on the current study findings, future research should aim to recruit a substantial and diverse sample to evaluate the contribution race and ethnicity may pose, while also measuring body shape satisfaction, weight perception, and BMI for a comprehensive understanding of the use of e-cigarettes for weight control.

Implications for Practice

The present study stresses the need for future health promotion interventions to address body shape satisfaction and weight perception, as well as alternative healthy weight control strategies relevant to diet and exercise in college women. As e-cigarettes pose major risks to users' overall health (NASEM, 2018) and many young adult e-cigarette users have been seen to transition to dual use (Hiler et al., 2020), these interventions should also be used to correct any misperceptions college women may have about e-cigarette use outcomes and educate on the risks associated with e-cigarette and combustible cigarette use (Pokhrel et al., 2020). Further, prevention efforts should focus on teaching healthy coping strategies for stress and weight concerns. Lastly, although Federal Tobacco 21, a law that raised the sales age for all nicotine and tobacco products to 21, has been in effect since 2019 (Tobacco Addiction Foundation, 2021), almost half (47.5%) of participants recruited throughout the US in this study fell below this age requirement. Health specialists should take this into account when addressing current and future e-cigarette and combustible cigarette use among young adults and adolescents as assuming this law is in place does not mean that individuals who are under 21 aren't using tobacco products.

Limitations

Several limitations appeared during this study. The first limitation occurred when uploading the survey to Qualtrics. In this process, the last three items from the Penn State E-

Cigarette Dependency Scale were deleted; thus, this study did not capture e-cigarette dependency to the extent that the scale intended to measure. Second, the study aimed to measure the use of e-cigarettes for weight control using the Smoking-Related Weight and Eating Episodes Test (SWEET; Adams et al., 2011) but the language used in this scale was not modified from “cigarettes” to “e-cigarettes” for all subscales. As some participants used both e-cigarettes and combustible cigarettes, this scale was not considered valid because dual users may have answered these questions differently based on their behaviors and choice of tobacco product use. Thus, participants reported reasons for e-cigarette use (i.e., to control weight, stop food cravings, suppress appetite) were used to measure e-cigarette use for weight control. Third, although the study measured weight perception and body shape satisfaction, BMI was not recorded, therefore, it is unknown whether these measures are accurate assumptions or discordant with actual weight. In addition, an assumption of this study was that participants viewed overweight and underweight as a weight problem rather than ideal or desired body shape. Future research should include wide-ranging options for reporting weight perception. Fourth, the current sample comprised of 18–25-year-old college women, hence, the findings may not be generalizable to adolescents, older adults, or men. Further, because this survey was self-reported, the quality of data may be limited by participants’ adherence to desire for social acceptability, as well as their commitment to respond honestly and accurately. Lastly, the novel Coronavirus-19 (COVID-19) may have played a role in college women’s use of e-cigarettes for weight control purposes due to isolation periods and trends in diet and exercise, though the researcher did not measure how COVID-19 effected this behavior.

Conclusions

Despite the limitations, this study provides substantial evidence that some college women use e-cigarettes as a method for weight control while also demonstrating the unique role body shape satisfaction, weight perception, frequency of e-cigarette use, and tobacco use status attribute to this behavior. Due to high rates of e-cigarette use among the college population (Mirbolouk et al., 2018), and e-cigarette product development and marketing for weight control (Morean & Wedel, 2017; Singh et al., 2018), the research community should continue to focus on establishing long-term health outcomes of e-cigarette use and developing evidence-based prevention programs that take into account the reasons and outcome expectancies college women have regarding e-cigarette use. Further, prevention strategies should focus on tobacco and e-cigarette education in order to help correct misperceptions, as well as educate on healthy weight control and coping strategies. As unhealthy weight control behaviors have been associated with multiple health-comprising behaviors (e.g., suicidal ideation/attempt, unprotected sex, substance use; Neumark-Sztainer et al., 1998), have been seen to predict weight gain overtime (Haynes et al., 2018), as well as predict eating disorder development (Striegel-Moore & Bulik, 2007), a collective effort must be taken among college women to prevent the use of e-cigarettes for weight control in order to help ensure long-term quality health, especially if these women are not using e-cigarettes for combustible cigarette cessation.

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Appendix A

Screener Survey:

- 1) Are you currently enrolled as a part- or full-time student in the U.S?
 - Yes
 - No
- 2) What gender do you identify with?
 - Male
 - Female
 - Transgender Male to Female
 - Transgender Female to Male
 - Gender Variant/ Non-Conforming
 - Not listed _____
- 3) In the past 30 days, I have used an e-cigarette...
 - Never
 - Once in 30 days
 - 2-3 times in 30 days
 - Once a week
 - Twice a week
 - 3-4 times a week
 - 5-6 times a week
 - Everyday
- 4) From the following, please identify one or more reason(s) that explain your e-cigarette use:
 - Healthier than smoking regular cigarettes
 - To stop food cravings
 - For stress relief
 - When I am hanging out with friends
 - When I am studying
 - To suppress my appetite
 - To control my weight
 - When I am drinking alcoholic beverages
 - When I am alone
 - Other _____

Appendix B

Survey Questions Used in Study Analysis:

- 1) Do you currently own your own electronic cigarette (“e-cigarette”)?
 - Yes
 - No
- 2) Does your e-cigarette contain nicotine?
 - Yes
 - No
 - I don’t know
- 3) What brand of e-cigarette do you use?
 - Fill-in
- 4) I usually use an e-cigarette ___ days in a typical week
 - Sliding scale from 0–7
- 5) In the past 30 days, have you smoked a cigarette, even one or two puffs?
 - Yes
 - No
- 6) In regard to cigarette smoking, are you a....
 - Never smoker
 - Former smoker
 - Occasional smoker
 - Regular smoker
- 7) (If former, occasional, or regular smoker) Have you ever used cigarettes to suppress your appetite and/or to control your weight?
 - Yes
 - No
- 8) (If former, occasional, or regular smoker) Do you currently use cigarettes to suppress your appetite and/or to control your weight?
 - Yes
 - No
- 9) What is your preferred e-cigarette flavor?
 - Tobacco
 - Menthol
 - Mint
 - Vanilla
 - Fruit (like strawberry, blueberry, or peach)
 - Candy or dessert (like apple pie, chocolate, or Jolly Rancher)
 - Alcohol (like pina colada, strawberry daquiri, or burbon)
 - Coffee (e.g. espresso, latte, cappuccino)
 - Other _____

(Start Penn State E-Cigarette Dependence Scale)

- 10) How many times a day do you usually use you e-cigarette? (Assume that one "time" consists of around 15 puffs or lasts around 10 mins)

- 0-4 times per day
- 5-9 times per day
- 10-14 times per day
- 15-19 times per day
- 20-29 times per day
- 30+ times per day

11) On days that you can use your e-cigarette freely, how soon after you wake up do you first use your e-cigarette?

- 0-5 minutes
- 6-15 minutes
- 16-30 minutes
- 31-60 minutes
- 61-120 minutes
- 121+ minutes

12) Do you sometimes awaken at night to use your e-cigarette?

- Yes
- No

13) If yes, how many nights per week do you typically awaken to use your e-cigarette?

- I do not wake up to use my e-cigarette
- 0-1 nights
- 2-3 nights
- 4+ nights

14) Do you use your e-cigarette now because it is really hard to quit?

- Yes
- No

15) Do you ever have strong cravings to use your e-cigarette?

- Yes
- No

16) Over the past week, how strong have the urges to use your e-cigarette been?

- None/ slight
- Moderate/ strong
- Very strong/ extremely strong

(End Penn State E-Cigarette Dependence Scale)

(Start SWEET Scale)

17) Please answer the following:

	Never	Rarely	Sometimes	Often	Always
When I feel hungry, I have an e-cigarette to curb my appetite	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I crave unhealthy food, I have an e-cigarette to avoid eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I feel like having a snack, I have an e-cigarette instead	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18) Please answer the following:

	Never	Rarely	Sometimes	Often	Always
If I don't smoke soon after a meal, I continue to eat more than I need	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smoking after a meal helps me to avoid overeating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am full, I smoke so that I won't eat more	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19) Please answer the following:

	Never	Rarely	Sometimes	Often	Always
When I feel fat, I have an e-cigarette	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I smoke when I am worried about gaining weight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I crave tasty food when I haven't smoked in a while	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel hungrier when I haven't smoked in a while	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(End SWEET Scale)

20) I am satisfied with the shape of my body

- Never
- Rarely
- Sometimes
- Often
- Always

21) I am currently

- Overweight
- Underweight
- Have no current weight problem

22) Thinking about the people who are important to you, how would you describe their views on using e-cigarettes?

- Very positive
- Positive
- Neither positive or negative
- Negative
- Very negative

23) How many of your 5 closest friends use e-cigarettes?

- Sliding scale from 0–5

24) How many of your 5 closest friends use e-cigarettes to suppress their appetites and/or to control their weight?

- Sliding scale from 0–5

25) The advertising for e-cigarettes appeals to me

- Yes
- No

26) What race do you most identify with?

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or other Pacific Islander
- White
- Not listed _____

27) Are you Hispanic, Latino/a, or Spanish origin (one of more categories may be selected)

- No, not of Hispanic, Latino/a, or Spanish origin
 - Yes, Mexican, Mexican American, Chicano or Chicana
 - Yes, Puerto Rican
 - Yes, Cuban
 - Yes, another Hispanic, Latino/a, or Spanish origin. Tell us where
-

28) How would you describe your sexual orientation?

- Bisexual
- Gay or Lesbian
- Heterosexual or Straight
- Not listed _____

29) What is your current student status?

- 1st year/ Freshman
- 2nd year/ Sophomore
- 3rd year/ Junior
- 4th year/ Senior

30) Are you currently a member (pledge, new, or initiated) of a SOCIAL sorority (not academic or service) at your university?

- Yes
- No

31) Which best describes where you currently live?

- On-campus housing (e.g. Residence Halls)
- Off-campus housing
- I live in a sorority house

32) How many credit hours are you currently enrolled in?

- Fill-in

E-CIGARETTE SURVEY



- Are you a female e-cigarette user (18-25)?
- Are you a part- or full-time college enrolled student?

We want to hear about your e-cigarette use!



Please scan the QR code or visit
https://ousurvey.qualtrics.com/jfe/form/SV_bHMbUp0QFhrfV77
to participate in this survey

Please contact Kyra Newcombe (kyra.v.newcombe-1@ou.edu) or Lois Coleman (lois.coleman@ou.edu) for more information