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Alcohol and Other Addictive Behaviors Among Bariatric Surgery Patients

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Alcohol and Other Addictive Behaviors Among Bariatric Surgery Patients

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science

at Virginia Commonwealth University.

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Abstract

ALCOHOL AND OTHER ADDICTIVE BEHAVIORS AMONG BARIATRIC SURGERY
PATIENTS

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Research has repeatedly highlighted a high rate of comorbidity of addictive behaviors in
both clinical and non-clinical samples. While polydrug use has received significant attention in
recent years, less is known about rates of comorbidity with behavioral addictions such as eating,
work, exercise, or sex. Individuals with a history of bariatric surgery may provide a unique
opportunity to examine the potential co-occurrence of addictive behaviors. High rates of food
addiction symptoms and changes in alcohol use patterns post-surgically have highlighted a
potential gap in our understanding of bariatric patients and their needs post-surgically. Using a
composite measure of addictive behaviors, the Shorter PROMIS Questionnaire (SPQ), this study
examined prevalence of alcohol and other addictive behaviors in individuals with a history of
bariatric surgery and the psychosocial correlates that are associated with such problems. The
present study found elevated rates of substance use and alcohol use problems when compared to
rates in the literature. In addition, the SPQ alcohol score was found to be strongly correlated to
measures of alcohol consumption quantity and frequency and other measures of alcohol related
problems. This provides preliminary support for SPQ alcohol subscale validity in bariatric

samples. Finally, several psychosocial correlates of alcohol use problems were examined. As hypothesized, gender, history of cannabis use, parental history of alcohol problems, and history of daily smoking all had significant associations to CAGE scores. Mean alcohol quantity and frequency variables decreased pre- to post-surgery. Time elapsed since surgery was not significantly correlated with post-surgical alcohol quantity and frequency or with SPQ alcohol subscale scores. Present study findings can inform future research to better understand the relationships between eating and other addictive behaviors in a post-surgical sample of bariatric surgery patients.

Alcohol and Other Addictive Behaviors Among Bariatric Surgery Patients

The co-occurrence of addictive behaviors has been well established in the research literature. For example, rates of smoking are much higher in individuals with alcohol and other drug use disorders compared to those without a substance use disorder. However, the majority of research has focused on substances such as alcohol, nicotine, and other drugs, with less attention paid to behavioral addictions such as problem gambling, uncontrolled eating, or excessive exercise. In part, this narrow focus stems from a lack of reliable and valid assessment measures for these other addictive behaviors. Patients who have undergone bariatric surgery provide a unique opportunity to look more broadly at the covariance of addictive behaviors. High rates of food addiction symptoms have been found among candidates for bariatric surgery and there is some data to support an increased propensity for addiction after surgery. Unfortunately, data have often been collected as part of pre-surgical screening, a setting in which SUDs are likely to disqualify a person from the surgery. Additionally, studies rarely include long term post-surgical follow up, resulting in a lack of knowledge about how these behaviors may change over time. The current study collected information on the prevalence and features of substance use and behavioral addictions among bariatric surgery patients. As rates of severe obesity increase, it becomes increasingly important to have a comprehensive understanding of the needs of this patient population and the presence of behaviors that may negatively impact surgical outcomes.

This thesis begins with a review of relevant research on addiction comorbidity, substance use among bariatric patients, and behavioral addictions. Previously published research on addictive behaviors among bariatric patients is examined to determine prevalence estimates and correlates of substance use and related problems in the target population. Next, study methods are described, summarizing the measures chosen for the survey and recruitment procedures. The

study involved an online survey that asked questions regarding lifetime history of substance use and addictive behaviors. Next, results from the present study are presented along with a discussion of the data including its clinical implications and limitations.

The specific aims of the current study were as follows:

Specific Aim 1. Determine lifetime pre-surgery prevalence of tobacco, alcohol, and other drug use and describe demographic and psychosocial correlates of such use and problems. The following hypotheses were tested:

1a) Males will have higher CAGE scores than females

1b) Daily smokers will have higher CAGE scores than non-daily smokers or non-smokers

1c) Individuals reporting a family history of alcohol problems will have a higher CAGE score than individuals without such a history.

1d) Individuals who endorse at least six lifetime instances of marijuana use will have significantly higher CAGE scores compared to individuals who report 0-5 instances of use.

1e) Individuals with a lifetime history of clinical depression will have significantly higher CAGE scores compared to individuals without such a history.

1f) Individuals reporting at least one lifetime traumatic event will have significantly higher CAGE scores compared to individuals reporting no such a history.

Specific Aim 2. Using the Shorter PROMIS Questionnaire (SPQ), describe pre-surgery lifetime mean scores for 8 potential excessive or addictive behaviors (alcohol, nicotine,

recreational drugs, prescription drugs, gambling, sex, caffeine, food bingeing, food starving, exercise, shopping, and work) and the proportion of bariatric surgery patients scoring in the clinically elevated range for each behavior.

Specific Aim 3. Examine validity of the SPQ alcohol subscale scores with comparisons to standardized measures of quantity and frequency of alcohol use and associated problems. The following hypotheses were tested:

1) Participants with clinically elevated CAGE scores (≥ 2) will have higher SPQ alcohol subscale scores than those with non-elevated scores (0-1) on those measures.

2) SPQ alcohol scores will correlate positively with heaviest lifetime quantity and frequency measures of alcohol use.

Specific Aim 4. Explore changes in alcohol and other addictive behaviors during the post-surgical period.

Alcohol and Other Addictive Behaviors Among Bariatric Surgery Patients

Co-Occurrence of Addictive Behaviors

The co-occurrence of addictive behaviors is overwhelmingly present in the literature. For example, individuals in addiction treatment are four times more likely to smoke cigarettes (Guydish et al., 2016), individuals with a history of problem gambling are more likely to report use of alcohol, cannabis, and tobacco (Walther et al., 2012), and polydrug use is considered the norm in patients with SUDs (Ives & Ghelani, 2006). In both clinical and non-clinical samples, there is a need to better understand the complex intersection of multiple addictive behaviors. There is significantly less known about the co-occurrence of behavioral addictions such as food, shopping, or sex. Such research is often hampered by a lack of consistency in how some behavioral addictions are defined (e.g., video games, food, shopping, sexual behavior). Despite this, gambling disorder became the first non-substance addictive behavior to be listed in the DSM 5 as a non-substance-related addictive disorder. Also, Caffeine Use Disorder and Internet Gaming Disorder were categorized as "conditions for further study" (APA, 2013). Research establishing an overlap in behavioral symptoms and reward circuit activation in the brain were cited as justification for these changes. While similar evidence has been found for other for other potentially addictive behaviors, such as excessive food consumption, sexual behavior, exercise, and shopping, the research was deemed insufficient to support inclusion in the DSM at the time of publication in 2014.

Research on these behavioral addictions has led to a growing body of research focusing on the commonality of neurobiological processes among addictive behaviors. Evidence suggests serotonin and dopamine play key roles in the initiation and maintenance of addictive behaviors (Blanco et al., 1996; Zack & Poulos, 2009). The reward circuitry in the brain, including the

ventral tegmental area and nucleus accumbens also play large roles in both substance use and

behavioral addictions (Brewer & Potenza, 2008; Zack & Poulos, 2009). Additionally,

physiological responses similar to those seen in persons with substance use disorders (SUD) such

as increased heart rate and cortical arousal, have been observed in persons with excessive

gambling (Coventry & Constable, 1999), exercise (Beh et al., 1996), food consumption

(Cummings et al., 1980), shopping (Christenson et al., 1994), and video game playing (Phillips et

al., 1995).

In addition to the biological similarities noted above, research has found impulsivity to be

an important factor in the initiation and maintenance of substance use disorders and problem

gambling (Hwang et al., 2012; Miner et al., 2009). Higher levels of impulsivity have also been

found in individuals with other behavioral addictions including sex (Cowie et al., 2019), exercise

(Lichtenstein et al., 2014), eating (Kim et al., 2018), and shopping (de Mattos et al., 2016).

Impulsivity is a multifaceted construct that aims to explain behavior that seems risky,

inappropriate, or results in undesirable circumstances (Morgan et al., 2011; Sharma et al., 2014).

It is largely considered a trait that is stable across a person's lifespan (Block & Kremen, 1996).

Models suggest the facets of impulsivity are distinct and each is associated with different

psychopathologies and problem behaviors. A five factor model of impulsivity has been

developed using data from the Urgency-Premeditation-Perseverance-Sensation Seeking-Positive

Urgency (UPPS-P) impulsive behavior scale. The dimensions include sensation seeking (the

tendency to seek out thrilling or novel stimuli), lack of premeditation (the tendency to not

consider the consequences of actions), lack of perseverance (the tendency to have difficulty

focusing on a long, boring, or difficult task), negative urgency (the tendency to act rashly due to

negative mood), and positive urgency (the tendency to act rashly due to a positive mood)

(Whiteside & Lynam, 2001a). There is some evidence associating all five of these facets to problematic consumption of drugs or alcohol (Berg et al., 2015; Latzman et al., 2013; Magid et al., 2007). Sensation seeking has also been linked to gambling and delinquent behaviors (Smith et al., 2007; Whiteside & Lynam, 2001b). Positive urgency has been more commonly linked to illicit drug use, risky sexual behavior, and immediate gratification behaviors (Cyders et al., 2010; Zapolski et al., 2009). Negative urgency has been linked to disordered eating behaviors, specifically binge eating and purging (Berg et al., 2015; Stojek et al., 2014).

Food Addiction

While not universally agreed upon, the concept of "food addiction" is bolstered by the neurobiological and behavioral similarities observed between excessive food consumption and substance use disorders. Magnetic Resonance Imaging (MRI) studies show the brain's reward circuitry (such as the amygdala) is activated in anticipation of receiving food (Gearhardt et al., 2011) Animal models of obese rats have found excessive consumption of food can lead to decreases in striatal D2R density – which is thought to be a major mechanism in the development of compulsive-like consumption or behavior (Johnson & Kenny, 2010). Rats have been observed to have withdrawal-like behavior changes, such as agitation and anxious movement, when transitioned from a high-sugar to a sugar free diet mirroring withdrawal symptoms well documented among substance users (Colantuoni et al., 2001; Wideman et al., 2005) Important behavioral and diagnostic aspects of substance use disorders have been observed in response to these high-sugar, high-fat (highly palatable) foods such as loss of control and continued use despite negative consequences, two of diagnostic criteria for DSM 5 SUD (Gearhardt et al., 2009; Johnson & Kenny, 2010). High levels of impulsivity, a common feature of other addictive

disorders, are also observed in obese adults. Additionally, a systematic review found particularly heightened reward sensitivity among obese individuals (Schag et al., 2013).

In addition to the overlapping personality correlates and neurobiological responses, interesting temporal trends have been highlighted involving substance use and eating patterns. Research has frequently documented excessive weight gain among individuals in SUD treatment (Billing & Ersche, 2015; Cocores & Gold, 2009; Cowan & Devine, 2008). Bariatric patients, especially those with a history of Roux-en-Y bariatric (RYGB) procedure, are overrepresented in SUD treatment programs (Ivezaj et al., 2012). A series of retrospective chart reviews found 2-6% of patients admitted SUD treatment have a history of bariatric surgery, averaging about 3% (Östlund et al., 2013; Reslan et al., 2014) compared to <1% prevalence of bariatric surgery in the general population (Liu & Funk, 2020). Among liver transplant patients, obesity and metabolic issues are a significant contributor to cardiovascular complications, morbidity, and mortality (Pagadala et al., 2009). Those with a pre-transplant alcohol use disorder (AUD) are at higher risk of developing post-transplant obesity and metabolic syndromes than patients without history of AUD (Anastácio et al., 2011; Pagadala et al., 2009; Yeomans, 2010). In a cross-sectional study, Anastacio et al. (2011), in a sample of 148 patients, found metabolic syndrome (including hypertension, glucose intolerance, hypertriglyceridemia, and low-density lipoprotein levels) in nearly three fourths (71.4%) of patients transplanted for alcohol liver diseases compared to 38.9% in patients transplanted for non-alcohol related liver disease. Also, Brunault et al. (2015) suggest that individuals post liver transplant for alcohol related issues may have higher risk of developing food addiction than patients receiving transplants for non-alcohol related liver disease.

Addiction Transfer Hypothesis

One theory proposed to explain the frequently observed relationship between problematic eating and substance use is the addiction transfer hypothesis. Also known as addiction shift or the behavioral substitution hypothesis, it suggests patients adopt a new addictive behavior while in remission for one addictive behavior. To illustrate, patients with addictive eating behaviors develop problematic alcohol use after undergoing weight loss surgery which physically limits their ability to consume excessive amounts of food. The empirical research on this issue is mixed, however in qualitative research, patients regularly cite behavioral substitution or addiction transfer as the reason for their substance use developing after surgery. One study of 24 patients in inpatient substance use treatment with a history of bariatric surgery found > 80% identified addiction transfer as the mechanism behind their current substance use issues (Ivezaj et al., 2012). According to this theory, patients develop post-operative addictive behaviors to replace "addictive like eating" after bariatric surgery prevents consumption of large amounts of food; this is possibly due to existing psychological distress due to unresolved trauma or dysfunctional coping (Yoder et al., 2018).

Comorbid addictive behaviors seem to have unique features and their high prevalence highlights a need for efficient and comprehensive methods of assessing these behaviors in both clinical and research settings. Research suggests the co-occurrence of addictive disorders can have a negative impact on treatment outcomes. For example, individuals attempting to quit smoking were less likely to succeed if they had concurrent excessive or binge eating behaviors (White et al., 2010). Additionally, integrated treatment for multiple addictive behaviors has been associated with improved treatment outcomes. Hartman et al. (2012), for example, found treatment addressing both hypersexual behavior and substance use was able to significantly

decrease both behaviors in long term follow-up compared to treatment group addressing only hypersexual behavior.

Measurement of Addictive Behaviors

Despite this, there is a lack of efficient and accurate ways to measure multiple addictive behaviors in individuals. Structured interviews are typically limited by disorders with assigned diagnostic codes and these interviews can be lengthy and inefficient in many settings (Topp et al., 1999). Measures have been developed and validated to assess addictive behaviors individually, such as the Yale Food Addiction Scale (Gearhardt et al., 2009) or the Internet Addiction Test (Young, 1998). However, administration of numerous different scales can be cumbersome and difficult to standardize, and the heterogeneity of scale formatting and conceptual background makes comparison across scales difficult (Schluter et al., 2020). Currently, very few transdiagnostic self-report measures exist for substance use disorders and behavioral addiction related problems. Several measures include addictive behaviors within measures for externalizing or risky behavior, such as the Composite Measure of Problem Behaviors (CMPB; Kingston et al., 2011) or the Risky, Impulsive, and Self-Destructive Questionnaire (RISQ; Sadeh & Baskin-Sommers, 2017). However, these scales each have significant limitations. The CMPB does not assess gambling behavior, which is well documented to occur in tandem with substance use disorders and other behavioral addictions. The RISQ is intended to assess frequency of risky behaviors but does not address the psychological symptoms of addiction and does not assess whether a person has clinically significant problems related to that behavior.

One measure that may be uniquely appropriate for composite assessment of addictive disorders is The Shorter PROMIS Questionnaire (SPQ). The SPQ was adapted from the

PROMIS Addiction Questionnaire (Lefever, 1988), a measure developed to assess addictive behaviors in patients admitted to a residential treatment. The measure was designed to capture seven common characteristics of addictive behavior: preoccupation, use alone, use for effect, use as medicine, protection of supply, using more than planned, and increased capacity or tolerance (Lefever, 1988). Factor analysis was conducted using clinical data collected from patients admitted to inpatient treatment across five years. Using the results of the factor analysis, each subscale was shortened to 10 items by eliminating poorly loaded items and combining items to produce a smaller set of items with adequate scale reliability. SPQ subscales have demonstrated high internal consistency and validity in both clinical and nonclinical populations (Christo et al., 2003; MacLaren & Best, 2010). The SPQ aims to measure problematic engagement in the measured behaviors and substances independent of the behavior's frequency. Participants can be considered to have a "significant problem" with each measured behavior if they score about the 90th percentile according to norms established by MacLaren & Best (2010) for adults.

Bariatric Surgery Patients

One group that may provide a unique opportunity to study the co-occurrence of addictive behaviors is bariatric surgery patients. Bariatric surgery is considered the most effective treatment for patients with severe obesity and obesity related comorbidities. Rising obesity rates and low patient compliance to lifestyle and pharmacological therapies have resulted in more frequent utilization of bariatric surgery as an obesity intervention. To be eligible for bariatric surgery, a patient must have a BMI ≥40 kg/m2 or a BMI ≥35 kg/m2 with obesity related comorbid diseases such as diabetes, hypertension, osteoarthritis, and sleep apnea (Mechanick et al., 2020; Sarwer & Heinberg, 2020). The data suggests extremely high rates of both clinically significant food addiction (according to the Yale Food Addiction Scale; Gearhardt, Corbin, &

Brownell, 2009) and subclinical food addiction symptoms among bariatric surgery patients and

individuals with severe obesity. A systematic review of the literature found rates of food

addiction (defined by the YFAS) ranged from 15-60% for bariatric surgery candidates (Guerrero

Pérez et al., 2018; Ivezaj et al., 2012) compared to 15-25% for obese patients (Corwin & Hayes,

2014; Ivezaj et al., 2019; Ziauddeen et al., 2012). Among all bariatric candidates the vast

majority displayed at least one symptom of food addiction. The most endorsed symptom (93.1%)

was "persistent desire to control consumption of certain foods" (Brunault et al., 2015). Post-

surgically, food addiction rates decrease significantly but are still elevated compared to

population rates (6-11%) (Pursey et al., 2014; Sevinçer et al., 2016).

Substance Use in Bariatric Patients

When an individual seeks out bariatric surgery, they typically must undergo a lengthy

evaluation process to determine their readiness for the procedure. While the surgical approval

process varies, it commonly involves collecting a thorough record of past and current substance

use. It is important for the treatment team to have a thorough understanding of patterns of use as

they may impact surgical outcomes. The level of concern varies by substance type and severity,

however, in some cases research data are limited. Most research investigating pre-operative

substance use in bariatric surgery candidates does not differentiate between individual drugs of

abuse, with prevalence rates most commonly present prevalence rates for alcohol and cannabis,

and then use of all other substances are grouped together. A cross sectional study of 393

treatment seeking obese patients at a Brazilian bariatric surgery center found 17.6% (n = 69) of

patients met DSM-IV criteria for a lifetime SUD but only 3.1% (n = 12) met DSM-IV criteria for

a current SUD (Duarte-Guerra et al., 2015). A similarly sized study (n = 288) by Kalarchian et

al. found prevalence of lifetime SUD defined by DSM-IV was 32.6% while current SUD

prevalence was 1.7% (Kalarchian et al., 2007). A study involving 1,311 patients from the

Cleveland Clinic Bariatric and Metabolic Institute found a prevalence of approximately 26% of

patients had a substance use history defined by past self-reported "excessive" consumption of

substances or past substance abuse treatment (Tarescavage et al., 2013). While prevalence rates

vary across studies depending on how substance use history is defined, most studies report

higher lifetime prevalence of substance use disorder among bariatric surgical candidates

compared to healthy control groups. Interestingly, current or past year prevalence of substance

use problems is lower than what is found in the general population (Kalarchian et al., 2007).

However, research suggests a history of substance use disorder should not be viewed as a

strong contraindication for bariatric surgery. In fact, research has found individuals with past

substance use disorders who have achieved sustained remission, defined by ≥ 1 year of

abstinence, have no higher risk of negative consequences post-surgery than those without such a

history (Sogg et al., 2016). One study with $N = 413$ patients, found a higher percentage of excess

weight loss (%EWL) at 6 and 12 months post-operatively among those with a history of

"excessive" use of one or more substance and/or a history of substance abuse treatment

compared to those without such history (Heinberg et al., 2010). Clark et al. (Clark et al., 2003)

found similar results when examining a sample of 80 individuals two years post-Roux-en-Y

gastric bypass. Patients who, through retroactive chart review, had a history of inpatient or

outpatient substance abuse treatment prior to surgery lost more weight post-operatively

compared to patients without such history. Findings should be interpreted with caution, however,

as the weight loss trend was based on a sample of only ten patients with a substance abuse

history and was also overwhelmingly female (Clark et al., 2003). Nonetheless, some have

hypothesized that this trend may be because these individuals benefitted from their history of making sustained, difficult behavior changes (Heinberg et al., 2010).

Less is known about post-operative substance use patterns in bariatric surgery patients despite the negative surgical outcomes associated with substance use after surgery. For example, cannabis use can lead to increased heart rate, immune suppression and hypertension which can interfere with proper healing after surgery (Rummell & Heinberg, 2014). Similarly, tobacco use can slow wound healing and increase the likelihood of other negative health outcomes, such as infection, ulcers, and pneumonia (Delgado-Rodríguez et al., 2003; Rasmussen et al., 2007; Schreiber et al., 2005). Because of these concerns, patients are strongly encouraged to quit smoking and cease cannabis use as part of preparation for surgery and often resources are given to aid patients in their cessation efforts (Rummell & Heinberg, 2014; Sogg et al., 2016). Substance use history and patterns are also important for providers to consider when developing a perioperative pain control intervention plan as patients with a history of prescription drug misuse may not be good candidates for pain management via narcotic drugs. Several case studies have documented bariatric patients developing opioid use disorder after opioids were prescribed for post-surgical pain management (Wendling & Wudyka, 2011). Extant research does not clearly illustrate the risk factors and psychosocial correlates of substance use post-surgery. Research is inconsistent and rarely separates data by type of substance; however, it suggests that males, patients who received Roux-en-Y Gastric Bypass (RYGB), and a history of substance use problems pre-surgery all increase the risk of post-surgical substance use (Duarte-Guerra et al., 2015; Kalarchian et al., 2008; Tarescavage et al., 2013).

The following section will review prevalence rates and risks associated with addictive behaviors in bariatric surgery patients. When available, information on pre- and post-surgical engagement in and correlates of these behaviors will be discussed.

Alcohol. Recent research findings have increased focus on alcohol use among bariatric surgery patients. AUD prevalence is about 7% among individuals 1-year post-surgically, which is similar to the prevalence rate in the general population (King et al., 2012; Substance Abuse and Mental Health Services Administration (SAMHSA), 2020), however if follow up is expanded to 7 years post-surgically, the rate of individuals meeting AUD criteria increased to 17% (King, Chen, Belle, et al., 2017). Researchers posit the trend is likely multifaceted with biological or metabolic factors related to changes in post-surgical alcohol absorption (Acevedo et al., 2018; Sarwer & Heinberg, 2020) alterations in the reinforcing properties of alcohol (Blackburn et al., 2017), addiction transfer from food to alcohol (Steffen et al., 2015), and increased use of alcohol as a coping strategy (Scholtz et al., 2015) The type of bariatric surgery has often been highlighted as a risk factor for alcohol use – individuals who undergo gastric bypass are at a heightened risk for AUD compared to patients who received gastric banding procedures (Azam et al., 2018; Conason et al., 2013; King, Chen, Courcoulas, et al., 2017; King et al., 2012). This relationship has previously been explained by metabolic changes related to bypass related procedures. However, patients with a history of sleeve gastrectomy have similar changes to their alcohol metabolism and absorption, but post-operative levels of AUD are not as high among sleeve gastrectomy patients as they are among gastric bypass patients (Miller-Matero et al., 2021).

Pre-operative Alcohol Use. In a longitudinal study conducted independent of clinical practice with 2,458 patients, King et al. (2012) surveyed bariatric patients pre-surgically and at

one and two years post-operatively. When participants were surveyed after surgical approval and within 30 days of their procedure, 7.8% of participants scored ≥8 on the Alcohol Use Disorders Identification Test (AUDIT). It is likely an underestimate as it did not capture patients are in early or sustained remission, given the nature of the AUDIT. Rates of alcohol problems are much lower when data from clinical practice are examined. Kalarchian et al. (2007), for example, found current alcohol abuse and current alcohol dependence rates in bariatric surgery candidates to be 0.0% and .07% respectively. The large discrepancy between research and clinical practice dada is likely due to patients under-reporting of alcohol consumption to avoid jeopardizing approval for surgery. Patients surveyed after being approved for surgery or independently of clinical care may be more forthcoming regarding their alcohol consumption patterns.

   Post-operative Alcohol Use. Multiple studies have examined the impact of bariatric surgery on alcohol consumption patterns and development of AUD, with mixed results. King et al. (2012) found that the number of alcoholic drinks consumed on a typical drinking day was significantly lower at one year post-surgery, higher pre-operatively than one year post-operatively, suggesting that alcohol consumption may initially decrease after surgery. However, number of alcoholic drinks consumed at two-year post-operative follow up was significantly higher than the assessment at one year follow-up (King et al., 2012). Alcohol consumption at a hazardous level (typically consuming at least three drinks per occasion or ever having six or more drinks on one occasion) was also significantly more common pre-operatively than at both one and two years post-surgery. Nearly one-fifth (19.6%, N=266) of the sample reported consumption at a hazardous level pre-operatively. In contrast, 13.3% (N=180) reported alcohol consumption at a hazardous level one-year post-operatively and 224 (16.5%) two-years post-operatively. However, they observed a significant increase in the frequency of alcohol

consumption at a hazardous level from one-year follow up (N=180, 13.3%) to two-year follow

up (N=224, 16.5%, p = .02). A small subsection of patients (2.6%, N=36) scored ≥8 on the

AUDIT pre-operatively compared to 43 (3.1%) at one-year follow up and 76 (5.5%) at two-year

follow up. Prevalence of AUDIT scores ≥8 was significantly greater two-years post-operatively

compared to pre-operative levels (p<.001) and significantly greater two-year post-operative

compared to one-year post-operative (p<.001). Similarly, prevalence of AUD was significantly

higher at two-year post-operative follow-up (N=133, 9.6%) compared to both pre-operative

levels (N=106, 7.6%) and one-year follow-up levels (N=101, 7.3%). Across multiple measures

of alcohol problems, prevalence was significantly higher two-years post-operatively compared to

prevalence pre-operatively (King et al., 2012). These results may suggest that while alcohol

consumption levels may decrease initially following bariatric surgery, they may begin to increase

with time post-surgery. However, patients are typically counseled to abstain completely from

alcohol consumption six months after surgery and are often discouraged from regularly

consuming alcohol after this initial period of abstinence, which has the potential to greatly skew

alcohol consumption data at one year follow up.

King et al. found that of the 167 patients who met criteria for an AUD post-operatively,

more than half (60.5%) did not report AUD at pre-operative assessment (King et al., 2012). In a

study of 201 patients who previously underwent RYGB or banded RYGB, Mitchell et al. (2015)

found 18.4% (N = 32) of patients met DSM-IV or AUDIT criteria for AUD within three years of

their bariatric procedure. This is in comparison to pre-operative prevalence of AUD, which was

28.9%. Further, 40.6% of the patients who met these criteria for AUD had no pre-operative

history of AUD. While this study included participants up to three years post-operatively, it did

not use years from surgery in their data analysis, so the temporal trends proposed by other

studies cannot be confirmed or refuted. While these numbers are troubling, it is important to

consider that both studies used data from bariatric surgery candidates. Therefore, participants

may have felt compelled to downplay their pre-operative alcohol consumption to safeguard their

surgical approval odds and these same participants may have felt comfortable being more

forthcoming during post-operative assessments.

In a U.S. survey of 318 bariatric surgery patients, Buffington (2007) found that 83%

reported they had consumed alcohol "upon occasion" or "regularly" since their surgery, which is

similar to the U.S. percentage of adults who endorse some level of alcohol consumption (85.6%)

(Substance Abuse and Mental Health Services Administration (SAMHSA), 2020). Of patients

who were considered regular users of alcohol (i.e., those who reported drinking one or more

alcoholic beverages weekly), 84% reported being more sensitive to the effects of alcohol post-

operatively and 28.4% reported they had a problem with alcohol control after surgery. In

contrast, 4.5% indicated they had alcohol control problems prior to surgery (Buffington, 2007). It

is important to consider that 84% of this sample was one or more years post-operative which

may mean the data is more representative of post-surgical alcohol use trends. Given that patients

are counseled to abstain from alcohol for at least six months after surgery, a larger proportion of

the sample being less than one year post-surgery could unintentionally deflate rates of alcohol

use. While these results are concerning, it is important to remember that the majority of patients

(between 60-70%) did not report any change in alcohol consumption patterns after treatment

(Ertelt et al., 2008). However, this data may reveal an unmet need for a subset of the bariatric

surgery population. More recent research has explored how bariatric surgery changes the way the

body processes alcohol and how that may contribute to AUD development post-operatively.

Jones et al. (2002) found that women who had undergone bariatric surgery reached their

maximal blood alcohol concentration (BAC) level more quickly than control groups and maintained a higher BAC for 20 minutes post consumption. There is additional evidence that shows bariatric patients take more time to return to a sober state when compared to control participants (Jones et al., 2002; Maluenda et al., 2010).

Psychosocial Factors. The psychosocial factors associated with alcohol use and related problems in a bariatric sample have received less attention. Being male and younger age has been associated with post-surgical alcohol consumption and heightened risk of AUD (King, Chen, Belle, et al., 2017; King et al., 2012). Additionally, alcohol consumption prior to surgery and pre-surgical AUD are both associated with post-surgical AUD (Cuellar-Barboza et al., 2015; King et al., 2012; Steffen et al., 2015; Suzuki et al., 2012). Despite the relatively high rates of depression and anxiety (Kalarchian et al., 2007, 2008), and maladaptive eating patterns among bariatric surgical candidates (Miller-Matero et al., 2014; Niego et al., 2007), there is not clear research to establish how such factors might post-surgical alcohol use and problems. At the population level, family history of AUD has been consistently associated with alcohol consumption quantity and frequency measures, and frequency of excess drinking using large-sample epidemiologic twin studies across the world (Heath, 1995; Heath & Martin, 1994; Kaprio et al., 1992; Prescott et al., 1994). Depression and history of trauma exposure are associated with increased risk of AUD at the population level (Aneshensel & Huba, 1983; Cutler & Nolen-Hoeksema, 1991; Hartka et al., 1991; Kilpatrick et al., 2000; Olenick & Chalmers, 1991; Widom et al., 1995). Despite our knowledge about risk factors for AUD among the population, little research has confirmed these psychosocial factors to be associated with AUD specifically in patients with a history of bariatric surgery. Given rising rates of bariatric surgery in the U.S. and

the unique considerations of post-surgical alcohol consumption, it is important to better understand the forces at play for this particular group of individuals.

Tobacco. Tobacco use among bariatric surgery patients has been consistency linked to increased risk of surgical complications in bariatric surgery, including wound complications (Gravante et al., 2007), respiratory distress (Haskins et al., 2014; Livingston et al., 2006), sepsis (Haskins et al., 2014), and ulcers (Spaniolas et al., 2018). Because of the well documented negative indications of tobacco use, best practice guidelines recommend a minimum of six weeks of abstinence from cigarette smoking prior to surgery and avoidance of tobacco use after surgery (Mechanick et al., 2013, 2020). About 40% of patients seeking bariatric surgery report lifetime history of regular cigarette smoking, which is comparable to rates in the general population, but some research has found rates as high as 67% (Delgado-Rodríguez et al., 2003). Current research shows that rates of smoking among adults one-year before bariatric surgery are lower than rates among the general population. While 45.2% of participants reported smoking at least 100 cigarettes in their lifetime, only 13.7% reported being an active smoker one-year pre-surgery, and only 2.2% reported being an active smoker at their surgery date. About 12.5% of the general population are current smokers (CDC, 2020). While on the surface, these quit rates seem promising, smoking prevalence increased back to slightly above pre-operative levels (14%) seven-years post-operatively.

Cannabis. Despite high rates of cannabis use in the United States, there is little research that documents the prevalence or effect of cannabis for bariatric surgery patients (Rummell & Heinberg, 2014). Shifting attitudes and laws about cannabis use have led to marijuana being seen simultaneously as a therapeutic agent, and illicit substance, and a recreational drug, further complicating interpretation of what little research exists (Chaudhry et al., 2016). Additionally,

characterizing different patterns of cannabis use is methodologically difficult – specifically

regarding quantity and frequency data, which may have significant impact on results (Shockcor

et al., 2021). Research on long-term regular cannabis use after surgery is documented to have

negative effects for surgical healing, but little is known about short-term, occasional, irregular, or

pre-surgical use. Prevalence rates for lifetime cannabis abuse/dependence as defined by DSM-IV

among bariatric patients are generally much lower compared to the general population (3.1% vs

8.5% respectively) (Stinson et al., 2006). The current recommendation is that providers should

consider regular cannabis use a contraindication for bariatric surgery (Rummell & Heinberg,

2014), often due to associating cannabis use with "high-risk" behaviors. However, the research

does not consistently link cannabis use to poor surgical outcomes.

One case study has demonstrated the efficacy of cannabis to treat nausea and vomiting in

a patient post-bariatric surgery (Merriman & Oliak, 2008). Also, cannabis has been approved for

pain management and treatment of nausea and vomiting for chemotherapy patients, and muscle

spasms for multiple sclerosis patients (Baron, 2015; Gurley et al., 1998). Research is mixed

regarding the use of cannabis to manage post-surgical pain. There are some findings to suggest

that pre-surgical cannabis use is correlated with higher need of opioids for pain management

post-bariatric surgery, but this study did not find significant impacts on 90-day weight loss

(Bauer et al., 2018). Often clinicians will cite evidence that THC, the active ingredient in

cannabis, increases feelings of hunger and increases likelihood of overconsumption as the main

source of concern regarding marijuana use after bariatric surgery (Barry et al., 2009; Berridge et

al., 2010). Because the goal of bariatric surgery is to restrict food intake, heightened hunger

levels could easily derail weight loss. Additionally, some studies have shown a greater

prevalence of disordered eating patterns in bariatric patients who engage in post-operative

cannabis use (Vidot et al., 2016). However, research tends to show lower prevalence of obesity among cannabis users compared to non-users in the general population (le Foll et al., 2013) and more recent research shows no relationship between marijuana use and long-term weight loss in a bariatric specific population (Vidot et al., 2016).

Other Substances. Much less is known about the impact of other substances on health outcomes and substance use disorders after bariatric surgery. There is some evidence of post-operative cocaine use causing vasculitis which can lead to stroke (Choi & Scarborough, 2004; Egred & Davis, 2005). There are case studies that document development opioid use disorder after use of prescription of opioid pain medication post-operatively, however, it is a small subset of patients ($< 1\%$) (Li & Wu, 2016). When studying post-operative bariatric patients engaged in substance use disorder treatment, 62.3% were receiving treatment primarily for alcohol use, 13.2% were in treatment for opioids, 9.4% were in treatment for alcohol and other drug use, 7.5% were receiving treatment for benzodiazepines, and 5.7% were seeking treatment for polysubstance abuse (Saules et al., 2010). Concerns about opioid use amongst bariatric patients are often due to the high rates of chronic pain among the severely obese. Severely obese patients are at an increased risk to experience chronic pain due to musculoskeletal issues, nutritional imbalances, depression, and lifestyle factors (Okifuji & Hare, 2015). Severity of pre-surgical pain has been found to be associated with increased risk of post-surgery continued or initiated opioid use (King et al., 2017). Approximately one-third (36%) of bariatric surgery candidates used some prescribed opioids in the year prior to surgery per retrospective chart review of 12,000 patients in the U.S. and 77% of patients with a history of pre-surgical opioid use continued long term use after surgery (Raebel et al., 2013). A large multisite observational study of patients found opiate use increased at seven-year post-operative bariatric follow up after an initial

decrease in opioid use rates at short term follow up appointments. Seven-year post-operative daily or regular opiate use surpassed baseline prevalence (King, Chen, Belle, et al., 2017; King et al., 2016).

Behavioral Addictions

Non-substance related addictions, also referred to as behavioral addictions, are syndromes that parallel substance use disorders and are characterized by a production of short term reward, long term harmful consequences, and decreasing level of control over the behavior (Grant et al., 2010). While many clinicians and researchers have long argued for the addition of such disorders to the DSM, the decision to widen the category of "Substance Related Disorders" to "Substance Use and Addictive Disorders" and include gambling disorder in the DSM 5, has encouraged further conversations about the conceptualization of behavioral addictions (Walther et al., 2012). In turn it has become more common for addictions to be seen as different expressions of an underlying addictive syndrome (Albanese & Shaffer, 2012). While there is a great deal of disagreement in the field regarding which behaviors are considered addictive, the behaviors included in the SPQ with the greatest amount of research support and documentation in bariatric samples are discussed below.

Gambling Disorder. While almost 90% of the adult population takes part in some form of gambling over their lifetime (Welte et al., 2002), problem or "at risk" gambling has lifetime prevalence of 3.5-5.1% (Volberg, 1996). Mitchell et al. 2015) surveyed a total of 201 patients post RYGB surgery using SCID-IV module on addictive behaviors. Only a small percentage of patients (N=4) endorsed either a lifetime history of pathological gambling or met criteria for pathological gambling in the three years following RYGB. Two participants (1.0%) had no lifetime prevalence of pathological gambling pre-surgically but met criteria after surgery and two

participants (1.0%) met criteria for pre-operative and post-operative pathological gambling (Mitchell et al., 2015). The relationship between problem gambling and risk-taking behaviors, specifically substance use, has been frequently established and a great deal of research has found higher prevalence of mental health problems among individuals who meet criteria for problem gambling – most commonly mood disorders, anxiety disorders and personality disorders (Chou & Afifi, 2011; S. W. Kim et al., 2006). In older adults, problem gambling has been associated with measures of poorer physical health (Erickson et al., 2005), but there is much about the relationship between gambling and physical health that is unclear. There is a slightly higher lifetime prevalence of DSM-IV-defined pathological gambling among those with feeding and eating disorders compared to healthy control individuals. Additionally, individuals with eating disorders related to underlying impulse control problems (such as binge eating disorder) have a lifetime prevalence of DSM-IV-defined pathological gambling of between 16 to 23%; this rate is slightly higher than individuals with eating disorders without an impulse control element (Jiménez-Murcia et al., 2013). Researchers hypothesize that binging and/or purging patterns of disordered eating may have common environmental and biological risk factors with problem gamblers or that they share a mechanism of action involving "loss of control" (Claes et al., 2012). However, it is important to remember that obesity is generally not considered a disease of impulse control so these findings may not apply broadly to pre-surgical bariatric patients. Instead, they may only apply to specific patients with patterns of eating psychopathology or loss of control behaviors.

Compulsive Exercise. Physical activity is overwhelmingly seen as a positive behavior with both physical and psychological benefits. Among bariatric surgery patients, exercise is considered a crucial part of a patient's life-long weight management plan. While exercise alone

does not generally lead to a substantial reduction in body weight, when paired with calorie restriction, it can prevent weight regain and provides multiple improvements in metabolic, cardiovascular, and musculoskeletal health. For a small subset of individuals, however, exercise can become an addictive behavior, characterized by a strong urge to exercise, often despite injury or illness (Meyer et al., 2011). This behavior pattern commonly coexists with dietary restriction, purging, and other unhealthy weight loss behaviors (Morris, 2008). The relationship between binge eating, so-called food addiction, and compulsive exercise is unclear; however, qualitative and phenomenological research does highlight patients describing exercise as "filling the void" that was once occupied by food (Bak et al., 2016; Lepage, 2010). In a study of 201 RYGB patients, two patients (1.0%) met criteria for exercise dependence pre-operatively, but zero participants met post-operative criteria for exercise dependence (Mitchell et al., 2015). There is a lack of consensus in research defining compulsive exercise or exercise dependence as an independent disorder outside of the compensatory behaviors commonly seen in other disorders. Inconsistent conceptualization of this concept can make research difficult to interpret and further examination is needed to understand how compulsive exercise may present in this population.

  Shopping Addiction. Shopping addiction was first conceptualized in 1994 when McElroy et al. identified common features among twenty psychiatric patients with problematic buying behavior (McElroy et al., 1994). While a disorder characterized by compulsive or problematic buying has yet to be included in the DSM, proposed diagnostic criteria include frequent preoccupation with buying or being subject to irresistible, intrusive, and/or senseless impulses to buy; frequently buying unneeded items or more items than one can afford; shopping for periods longer than intended; and experiencing adverse consequences because of the buying behavior (McElroy et al., 1994). A recent meta-analysis found that about 5% of the population

experience compulsive buying, with rates as high at 16% in samples recruited from stores (Maraz et al., 2016). In a student of 201 patients post RYGB, 20 patients (~10%) met DSM-IV criteria for compulsive buying either before or after surgery. Six (3.0%) met criteria only pre-operatively, three (1.5%) met criteria post-operatively without pre-operative history of compulsive buying, and 11 (5.5%) met criteria both pre- and post-operatively (Mitchell et al., 2015).

Research has examined the association between compulsive buying and other disorders of self-regulation, such as kleptomania, intermittent explosive disorder, trichotillomania, and pathological gambling (McElroy et al., 1994; Mueller et al., 2010; Schlosser et al., 1994). Research has found high rates of binge eating among compulsive buyers when compared to health controls (Faber et al., 1995; McElroy et al., 1994); however, binge eating disorder's formal criteria were only laid out in 2013 with the publication of the DSM 5, indicating that updated research on the relationship between the two conditions is needed. Some researchers have proposed that the close relationship between these two disorders is due to the underlying, unifying drive to excessively gather and store goods or calories, commonly known as hoarding (Nicoli de Mattos et al., 2018). However, research on this topic is scarce and what has been published utilizes a sample from patients seeking treatment for their compulsive buying, which may limit the generalizability of these insights to the proposed study's population.

Method

Study Procedures

Recruitment

Participants were recruited from several difference sources.

ResearchMatch. Eligibility criteria were entered into ResearchMatch database and information about the study was sent to participants. First, ResearchMatch members with a history of bariatric surgery on their participant profile were targeted. Second, study information was released. to the general participant pool. ResearchMatch members were sent an IRB-approved message about the study. Exact recruitment language and materials can be found in Appendix A. Individuals who were interested in learning more about the study were instructed to opt into study communications, which made their email address available to the study team. IRB-approved emails with additional information were sent to these participants. This email included a link to the survey which began with screening questions to verify eligibility. The study email in its entirety can be found in Appendix A.

Social Media. Both Reddit and Facebook were used to identify and target online communities for individuals post-bariatric surgery. Electronic flyers were posted on these online communities and individuals were instructed to email the study team for additional information if they were interested in participating. A copy of the electronic flyer used for recruitment can be found in Appendix A.

Informed Consent

Those who were interested in participating were directed to the study's electronic consent form, which provided a description of the study, which stressed its voluntary and anonymous nature. The study's electronic consent form can be found in Appendix A. Participants were informed that the survey would take about 20 minutes to complete, and they were able to stop at any time without facing negative repercussions. Those who elected to participate were prompted to proceed to study instruments. All study procedures and documents were reviewed and approved by the VCU IRB.

Screening for Study Eligibility

After consenting to participate, participants were screened to confirm study eligibility. During this screening they were asked about the following (corresponding to inclusion/exclusion criteria): age, history of weight loss or bariatric surgery, time elapsed since bariatric surgery, number of bariatric surgeries performed, and history of bariatric procedures revised or reversed. Full screening items can be found in Appendix B.

Participants

The study recruitment process is illustrated in the consort diagram (Figure 1). The majority of participants were recruited through ResearchMatch.org's data base. Initially, N=368 ResearchMatch members who indicated a history of bariatric surgery in their participant profile were provided basic study information. In addition, N=69,161 individuals within ResearchMatch's general participant pool were subsequently sent study information. Of those, N=417 requested and received more information about the study. Simultaneously, electronic study flyers were circulated through social media channels specifically targeting bariatric surgery-related communities. This yielded 68 individuals who expressed interest in learning more about the study. In total, 485 individuals expressed interest in the study and received emails with additional study information and an invitation to participate. Of these, N=315 (64.9%) individuals responded to these study invitations and consented to participate in the study. Of these, 167 (53%) were found to be ineligible based on their responses to initial survey screening items. In addition, N=3 individuals did not complete screening items, making them ineligible. The remaining N=145 individuals met study criteria and were prompted to complete study measures. A small number (N=5) of participants chose to cease participation in the study after screening measures were complete. An additional 7 of the remaining N=140 were subsequently

removed from the data set because they did not complete core survey items. In total, 133

individuals were interested, eligible, and completed at least the core survey items. Study

recruitment process is illustrated in Figure 1.

Figure 1

Consort Diagram
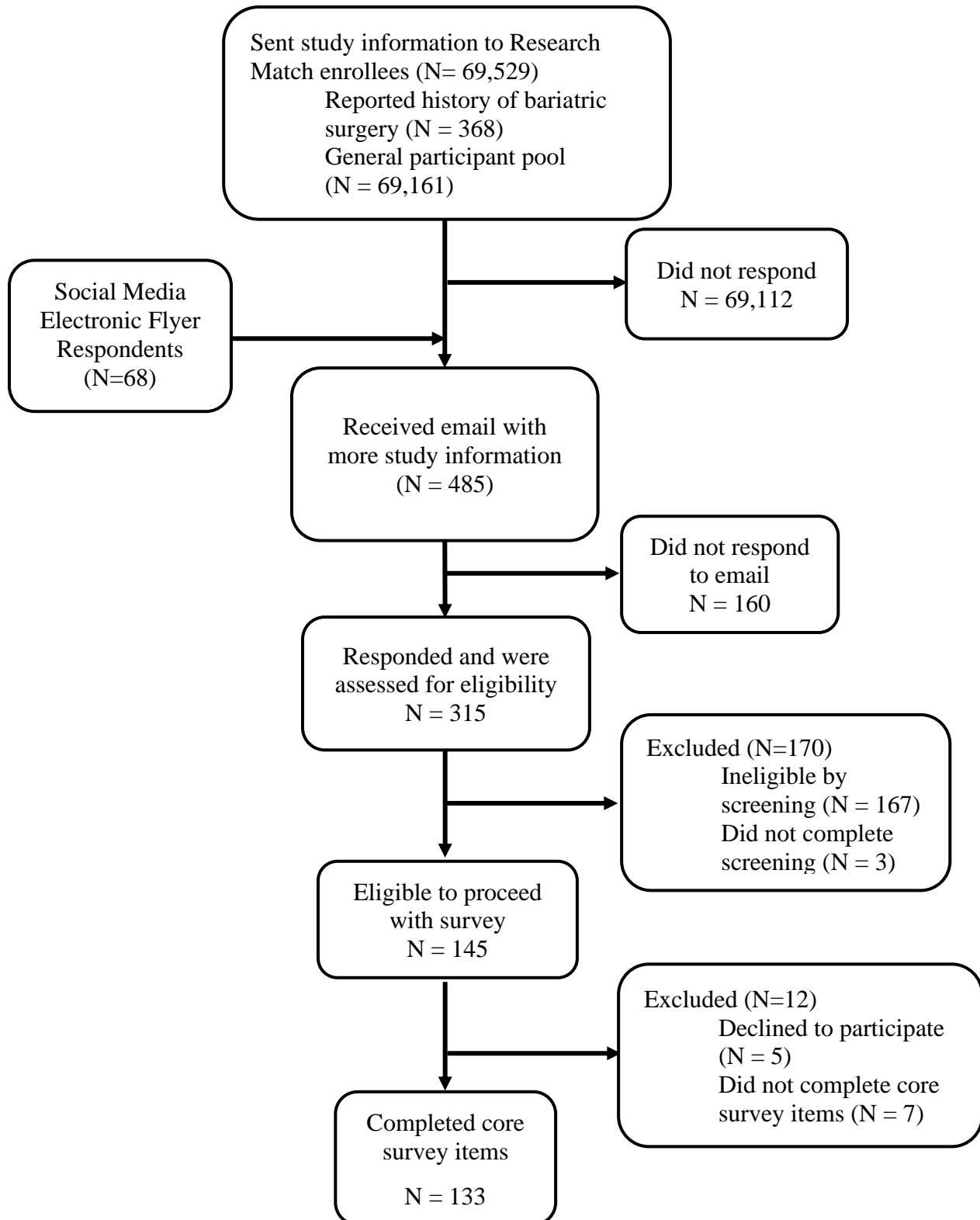
Participant Compensation

Participants who completed the survey had the chance to win one of four $10 Amazon gift cards. Upon completing the survey, they were directed to a separate page where they were asked to double enter their email address. All entries were assigned a numerical value and a random number generator was used to select the winners.

Measures

The survey was administered through REDCap and took participants approximately 20 minutes to complete.

Demographics

Participants were asked to self-report age, race, gender, and ethnicity. They were also asked to specify what kind of weight loss surgery they received, and the approximate date (month, year) their weight loss surgery occurred. Finally, they were asked to provide their highest pre-surgery weight, lowest post-surgery weight, and current weight.

BMI. Participant BMI will be calculated using the following formula: weight (lbs.) / [height (in)]^2 x 703 (CDC, 2017). BMI will be calculated for three time points – current, highest presurgical, and lowest postsurgical. Based on these calculations participants will be classified according to WHO guidelines for BMI classifications (2010). A BMI <18.5 is classified as underweight, a BMI of 18.5-24.9 is classified as normal weight, a BMI of 25-29.9 is classified as pre-obesity or overweight, a BMI of 30.0-34.9 is classified as obesity class I, a BMI of 34.9-39.9 is classified as obesity class II, and a BMI >40 is classified as obesity class III (WHO, 2010).

Addictive Behaviors

Minimum consumption levels for each substance were established. Only participants

who reached minimum consumption levels were considered a positive screen, and thus were

eligible to complete the survey items referencing that respective behavior. For the alcohol

domain, individuals who reported consuming at least one full alcohol beverage in their lifetime

were asked additional alcohol questions. For the tobacco domain, only individuals who reported

a history of daily tobacco use (cigarettes, e-cigarettes, chewing tobacco) or smoking more than

100 cigarettes in their lifetime were asked additional tobacco questions. For the caffeine domain,

individuals who reported a history of consuming caffeinated coffee and/or caffeinated energy

drinks five or more times per week were asked additional caffeine questions. For the other

substance use domain, individuals were asked which substances they had used six or more times

across their lifetime; participants who reported six or more uses of at least one substance pre- or

post-surgery were asked additional questions about their substance use. For behavioral

addictions, participants were asked to report lifetime problems related to the following

behaviors: gambling, sex, exercise, work, food bingeing, and food starving. Individuals who

reported a lifetime history of problems related to that behavior were asked additional questions

related to that behavior. Screener questions for each potentially addictive behavior can be found

in Appendix B.

Shorter PROMIS Questionnaire. Prevalence of and behaviors/attitudes regarding

addictive behaviors were measured using the Shorter PROMIS Questionnaire (SPQ) (Lefever,

1988). The 160-item measure consists of 16 scales, each containing 10 items answered on a scale

of 0 (not like me) to 5 (very much like me) and yields scale scores from 0-50. All items were

administered using a visual analog scale. The SPQ includes subscales on the following domains:

alcohol, caffeine, drugs, exercise, food bingeing, food starving, gambling, tobacco, prescription drugs, sex, shopping, work, compulsive helping (dominant/submissive), and compulsive relationship (dominant/submissive). The domains of compulsive relationship (dominant/submissive) and compulsive helping (dominant/submissive) were excluded given the lack of empirical evidence establishing these constructs as addictive behaviors. The subscales of prescription drugs and drugs were combined to minimize survey length and due to lack of empirical research establishing these as separate domains. Only individuals who were considered a positive screen for the behavior assessed be asked the SPQ subscales related to that respective addictive behavior.

Alcohol. Quantity and frequency questions were adapted from the 2012 wave of the National Longitudinal Survey of Youth (NLSY; Bureau of Labor Statistics, 2012). NLSY quantity and frequency questions were selected due to the accuracy of these items compared to other alcohol questionnaires related to other quantity and frequency questionnaires (Dawson, 2003; Stevens et al., 2020). Quantity and frequency information was collected for the heaviest 30 day period of drinking pre-surgery and post-surgery as well as alcohol consumption in the past 30 days (if different from heaviest post-surgically). For each of these time periods, participants were asked to report the number of drinking days, number of drinks on an average drinking day, and number of binge drinking days (4+ drinks for females, 5+ drinks for males). The full alcohol questionnaire can be found in Appendix B.

CAGE Alcohol Questionnaire (CAGE). The CAGE is a 4-item questionnaire that can indicate potential problems with alcohol (Ewing, 1984). This screening measure has proven useful for screening and early diagnosis of alcoholism. The questions focus on Cutting down, Annoyance by criticism, Guilty feeling, and Eye-openers. This measure has been extensively

validated in the field. It is reported to have a 93% sensitivity and 76% specificity for the

identification of excessive drinking (Bernadt et al., 1982; Svikis & Reid-Quiñones, 2003). A

score of two or higher is typically considered the best cut-off to identify individuals at risk for

problem drinking.

Tobacco. Quantity and frequency questions for tobacco use were adapted from the 2012

wave of the National Longitudinal Survey of Youth (NLSY; Bureau of Labor Statistics, 2012).

The full battery of tobacco items can be found in Appendix B. Participants were asked to classify

their lifetime cigarette use (never, >100, ≤100), history of daily smoking, cigarettes per day

during heaviest period of smoking, use of other tobacco products (chewing tobacco, e-cigarettes,

cigarillos), perception of problems related to tobacco (problem only pre-surgically, problem only

post-surgically, problem both pre- and post-surgically, or never had a problem), perception of

changes in tobacco consumption pre- to post-surgery (increased after surgery, decreased after

surgery or did not change after surgery), and their history of using tobacco as a weight or

appetite management tool.

Caffeine. Participants were asked to consider the period in their life where their caffeine

consumption was the heaviest. For this period, they were asked to report how often weekly they

consumed coffee (every day, 5-6 days a week, 3-4 days a week, 1-2 days a week, not at all) and

how often they consumed caffeinated energy drinks (ex. Monster, Red Bull, 5 Hour Energy

Shots) (every day, 5-6 days a week, 3-4 days a week, 1-2 days a week, not at all). Those who

screened positive proceeded to answer additional caffeine related items including their

perceptions of problems related to caffeine use (problem only pre-surgically, problem only post-

surgically, problem both pre- and post-surgically, or never had a problem) and their perception of

changes in caffeine consumption pre- to post-surgery (increased after surgery, decreased after

surgery or did not change after surgery). The full battery of caffeine items can be found in

Appendix B.

Other Substance Use. Participants were asked which substances they had used at least

six times in their lifetime. The following substances taken from the Shorter PROMIS

Questionnaire (SPQ) were listed: marijuana (weed, blunts), heroin, prescription opioids

(Oxycodone, pain killers), stimulants (cocaine, methamphetamine), sedatives (benzodiazepines,

GHB), synthetics (K2/Spice, bath salts, ketamine), and hallucinogens (MDMA, ecstasy/molly,

LSD, PCP, peyote, psilocybin). Participants whoscreened positive (reported using at least one

substance six or more times) proceeded to answer questions about their perception of problems

related to substance use (problem only pre-surgically, problem only post-surgically, problem

both pre- and post-surgically, or never had a problem) and their perception of changes in

substance consumption pre- to post-surgery (increased after surgery, decreased after surgery or

did not change after surgery). The fully battery of other substance use items can be found in

Appendix B.

Behavioral Addictions. The following behavioral addictions were assessed: exercise,

food bingeing, food starving, gambling, sex, shopping, and work. For each of these behaviors,

individuals who screened positive for history of problems, were asked additional questions about

their history with that behavior and their perception of problems related to the behavior.

addiction assessed, those who were considered a positive screen were asked additional questions

about their perception of problems related to each addictive behavior. They were asked to report

their perception of problems related to substance use (problem only pre-surgically, problem only

post-surgically, problem both pre- and post-surgically, or never had a problem) and their

perception of changes in substance consumption pre- to post-surgery (increased after surgery,

decreased after surgery, or did not change after surgery).

Health and Psychopathology Measures

Family History of Substance Use. Family history of drug and alcohol problems was

assessed using questions adapted from the National Institute of Alcohol Abuse and Alcoholism

(NIAAA) National Epidemiologic Survey on Alcohol and Related Conditions (NESARAC;

NIAAA, 2012). Individuals are asked to report which biological family members had a lifetime

history of problems with drugs or alcohol. For each family member, the participant is asked "Do

you think X has ever had a drinking problem?" Followed by, "Do you think X has ever had

problems with other drugs?" For each family member listed, it was specified that they were

biological relatives. For example, biological siblings included the specifier (same biological

mother and father). Separate items were asked for biological mother and biological father. For

each item, participants could respond with yes, no, or I don't know/Refuse. Items related to

biological siblings and biological aunts/uncles had N/A response options for participants without

these family members. Full family history of substance use questionnaire can be found in

Appendix B.

Brief Trauma Questionnaire (BTQ). The BTQ is a 10-item self-report measure

developed from the Brief Trauma Interview (BTI) (Schnurr et al., 1995). The questionnaire looks

at an individual's lifetime traumatic exposure (Schnurr et al., 1999). Individuals are asked to

indicate which of 10 events they experience over their lifetime.

Lifetime Major Depressive Episode (MDE). A 4-item brief screening instrument

developed by Hitsman et al. (2011) was used to investigate participant history of major

depression. This measure has demonstrated high predictive value at identifying individuals who meet DSM-IV criteria for lifetime MDE with up to 85% accuracy (Hitsman et al., 2011). Individuals are asked about experiences with common symptoms of depression such as anhedonia, loss of interest, fatigue, and the duration of these symptoms. For an individual to screen positive for MDE, they must endorse experiencing depression symptoms most of the day nearly every day for two weeks or longer. An individual is considered subclinical for MDE if they endorse experiencing depression symptoms most of the day every day for a period of less than two weeks. Those who deny experiencing depression symptoms most of the day every day are considered negative screen for MDE. This measure can be found in its entirety can be found in Appendix B.

Study Variables

For data analysis, the following variables were created:

Marijuana Use

Based on responses to substance use history items, a binary variable was created to identify those with a history of marijuana use and those without such a history. Those who indicated six or more instances of marijuana use pre- and/or post-surgically were coded as positive for a history of marijuana use and those who reported 0-5 instances of marijuana use over their lifetime were coded as negative for a history of marijuana use.

Trauma Exposure

Participants who endorsed one or more traumatic event items on the BTQ were coded as positive for a history of trauma exposure. Those who did not endorse any such events were coded as negative for trauma exposure.

Family History of Alcohol Problems

Using participant responses to the NESARAC questions about alcohol problems among various biological family members, the following variables were created:

1. Parental History of Alcohol Problems: Individuals who reported their biological mother and/or biological father to have an alcohol problem were coded yes. Individuals were coded no if neither parent met that criterion.

2. First Degree Relative with Alcohol Problems: Individuals who reported a biological parent and/or a biological sibling (same biological mother and father) as having an alcohol problem were coded yes. Individuals were coded no if neither parent nor siblings (if any) met this criterion.

3. First and/or Second Degree Relative with Alcohol Problems: Individuals who reported a biological parent, one or more biological sibling, a biological grandparent, and/or a biological aunt/uncle were coded yes. Individuals who reported no first of second degree family members with a history of alcohol problems were coded no.

Lifetime History of Major Depression

Using participant responses to the Lifetime MDE Screening were coded into a binary variable for analysis. Individuals who scored positive for MDE were assigned a value of 1, considered positive for lifetime history of MDE. Those who scored subclinical or negative for MDE were assigned a value of 0, considered negative for lifetime history of MDE.

Change in Participant Alcohol Consumption Pre- to Post-Surgery

Participant numeric estimates of heaviest quantity and frequency of alcohol use and binge drinking pre- and post-surgery were descriptively compared and classified into one of three

groups: pre-surgery > post-surgery, pre-surgery < post-surgery, no difference. This was done

separately for frequency (drinking days per month), quantity (drinks per day), and binge episodes

(number per month).

Time Since Surgery

Time elapsed since bariatric surgery (Range 1.05-41.5 years) was re-coded into a binary

variable with participants categorized as either 1-10 years post bariatric surgery or >10 years

post-surgery.

Shorter PROMIS Questionnaire (SPQ)

For each SPQ scale, clinical cutoff scores from a previously published study were

utilized. Christo et al. (2003) established the clinical cut-off for each subscale using data from a

normal non-clinical sample. Individuals scoring at or above the 90th percentile were categorized

as a clinically significant SPQ subscale score. Those below the cut-off were labeled as non-

clinically significant SPQ subscale scores. The following summary gives cut-off scores for each

subscale:

- Alcohol: ≥ 34
- Tobacco: ≥ 41
- Caffeine: ≥ 9
- Other substance use: ≥ 20
- Food bingeing: ≥ 26
- Food starving: ≥ 20
- Gambling: ≥ 8
- Shopping: ≥ 25

- Work: ≥27

- Exercise: ≥23

Data Analysis

From this sample, N=6 participants had their data removed due to eligibility issues. 5 of these were due to reporting a surgery date <1 year ago and 1 reported receiving liposuction, which is not classified as a bariatric surgery for the present study. The final sample consisted of N=127 participants. Statistical analyses were performed using SPSS version 28 (IMB Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp). Skewness and kurtosis were assessed to ensure all necessary assumptions were met for statistical analyses. Significance level was set at 0.05 for all analyses. Data were cleaned to remove erroneous or missing data.

Specific Aim 1: Determine lifetime pre-surgery prevalence of tobacco, alcohol, and other drug use and describe demographic and psychosocial correlates of such use and problems.

Descriptive statistics were generated of lifetime substance use, CAGE scores, alcohol consumption quantity and frequency variables, and history of substance related problems. The following hypotheses were tested:

1a) Males will have higher CAGE scores than females

1b) Daily smokers will have higher CAGE scores than non-daily or non-smokers

1c) A family history of alcohol problems will be associated with a higher CAGE score than those without such a history

1d) Individuals who endorse at least six lifetime instances of marijuana use will have

significantly higher CAGE scores compared to individuals who do not report such use.

1e) Individuals who screen positive for lifetime history of major depressive will have

significantly higher CAGE scores compared to individuals with no such a history.

1f) Individuals with at least one lifetime traumatic event (BTQ +) will have significantly

higher CAGE scores compared to individuals without such a history.

These hypotheses were tested using univariate analysis. Mean CAGE scores were

compared for significant differences using t-tests.

Specific Aim 2: Using the Shorter PROMIS Questionnaire (SPQ), describe mean scores

for eight potentially excessive or addictive behaviors (alcohol, nicotine, recreational drugs,

prescription drugs, gambling, sex, caffeine, food bingeing, food starving, exercise, shopping, and

work) and the proportion of individuals scoring in the clinically elevated range for each

behavior.

Frequency data is presented showing percentage of participants that scored in clinically

significant range for each behavior as measured by the SPQ subscale. For alcohol, tobacco, and

caffeine, means scores are presented for each item summarizing which aspects of substance use

were most prevalent in our sample.

Specific Aim 3: Examine the validity of the SPQ alcohol subscale using standardized

measures of quantity and frequency of use and associated problems.

Two hypotheses were tested. First, participants with clinically elevated alcohol CAGE

scores ($\geq$2) will have higher SPQ alcohol subscale scores than those with non-elevated CAGE

scores (0-1). This hypothesis was tested using univariate analysis. Specifically, t-tests were

utilized to compare mean SPQ alcohol subscale total scores for participants with CAGE scores

≥2 to SPQ alcohol subscale total scores for participants with CAGE scores of 0-1 for significant

differences. Additionally, t-tests were performed to test for significant difference in mean item

scores between participants with CAGE scores ≥2 and those with CAGE scores of 0-1.

Second, SPQ alcohol scores will correlate positively with heaviest lifetime quantity and

frequency measures of alcohol use. Bivariate correlations, specifically Pearson's correlations,

were performed to examine associations between SPQ alcohol subscale scores and alcohol

consumption quantity and frequency variables. Alcohol variables analyzed included: pre-surgical

drinking days (30-day heaviest period of drinking), pre-surgical drinks per day (30-day heaviest),

pre-surgical binge drinking days (30-day heaviest), post-surgical drinking days (30-day

heaviest), post-surgical drink per day (30-day heaviest), and post-surgical binge drinking days

(30-day heaviest).

Specific Aim 4: Explore changes in alcohol and other addictive behaviors during the

post-surgical period.

This aim is exploratory. Self-reported alcohol quantity and frequency data for heaviest

30-day period of alcohol consumption was compared to quantity and frequency data for heaviest

30-day period of alcohol consumption post surgically. Mean drinking days per month, mean

drinks per day, and binge drinking days per month pre-surgically was compared to post-surgical

values for significant differences using univariate analysis. Specifically, t-tests were used for this

analysis. Participant estimates of heaviest quantity and frequency of alcohol use and binge

drinking were descriptively compared for frequency (drinking days per month), quantity (drinks

per day), and binge episodes (number per month). Based on these comparisons, participants will

be classified into one of three groups: pre-surgery > post-surgery, pre-surgery < post-surgery, no difference. Descriptive statistics are presented to show the proportion of participants in each group.

Participant perceptions of changes in addictive behaviors (including alcohol and other substance use) pre- to post- surgery were summarized. Descriptive statistics were presented to examine percentage of individuals who self-reported problems related to each addictive behavior and changes in frequency or intensity of these behaviors.

T-tests were also used to compare participant heaviest alcohol quantity and frequency variables, SPQ alcohol subscale scores, and CAGE scores for individuals who were between 1-10 years post bariatric surgery to individuals >10 years post-surgery using univariate analysis. Specifically, t-tests were utilized. Additionally, Pearson correlations were used to examine associations between time post-surgery (Range 1.05-41.5 years) and a variety of alcohol use measures, including: SPQ alcohol scores, post-surgical drinking days (heaviest 30-day), post-surgical mean drinks per day (heaviest 30-day), and post-surgical binge drinking days per month (heaviest 30-day).

Results

Sample Characteristics

As displayed in Table 1, participant mean age was 47.9 years (SD=13.0) with a range from 26-73 years. Over 3/4ths of the sample (76.8%) identified as female, and the majority of participants were white (84%) and non-Hispanic/Latinx (89%). Height, weight, and surgical history data are also shown in Table 1. About half of participants (49.6%) had undergone a sleeve gastrectomy. Current weight ranged from 105 lbs.-376 lbs. with a mean of 206.8 lbs.

(SD=57.2). Obesity at their heaviest pre-surgical weight. There was no statistical relationship between current participant height and weight as seen in Figure 2. Prior to bariatric surgery, the majority of participants (79.7%) had a BMI classified as Class III obesity. Current BMI was more varied with a relatively even distribution across the five categories, and approximately 20% of participants falling into each BMI classification. As shown in Table 1, more than half of the sample screened positive for major depressive episode (lifetime). More than one half (59.7%, N=71) of participants endorsed exposure to at least one traumatic event in their lifetime and about half of participants (51.4%, N=65) reported parental history of alcohol problems.

Table 1

Demographics

	Mean (SD)
Age (years)(N=118)	47.9 (13)
Race (N=125)	**% (N)**
White	84% (105)
Black/African American	12.8% (16)
Native American or Pacific Islander	.8% (1)
Other	2.4% (3)
Gender (N=125)	**% (N)**
Male	22.4% (28)
Female	76.8% (96)
Gender Variant/Non-Conforming	.8% (1)
Ethnicity (N=127)	**% (N)**
Hispanic or Latinx	11% (14)
Not Hispanic or Latinx	89% (113)
	Mean (SD)
Current Weight (lbs.)(N=110)	206.8 (57.2)
Height (N=128)	66.6 (3.7)
Current BMI (N=110)	32.8 (8.5)
Current BMI Classification (N=110)	**% (N)**
Normal Weight (18.5-24.9)	20% (22)
Overweight (25-29.9)	19.1% (21)
Class I Obesity (30-34.9)	22.7% (25)
Class II Obesity (35-39.9)	19.1% (21)
Class III Obesity (≥40)	19.1% (21)

Highest Pre-surgical BMI (N=123)	% (N)
Class I Obesity (31-34.9)	1.6% (2)
Class II Obesity (35-40)	18.7% (23)
Class III Obesity (>40)	79.7% (98)
Lowest Post-surgical BMI (N=122)	**% (N)**
Underweight (<18.5)	4.1% (5)
Normal Weight (18.5-24.9)	34.4% (42)
Overweight (25-29.9)	23.8% (29)
Class I Obesity (30-34.9)	23.8% (29)
Class II Obesity (35-39.9)	7.4% (9)
Class III Obesity (≥40)	6.6% (8)
Bariatric Surgery Type (N=124)	**% (N)**
Sleeve Gastrectomy	49.6% (63)
Roux-en-Y Gastric Bypass	31.5% (40)
Duodenal Switch	4% (5)
Gastric Balloon	.8% (1)
Gastric Band/Lap Band	10.2% (13)
Other procederes	1.6% (2)
	Mean (SD)
Time Elapsed Since Surgery (years)	8.49 (7.58)
Time Elapsed Since Surgery (months)	102.35 (90.99)
Time Elapsed Since Surgery	**% (N)**
1-10 years since surgery	66.1% (84)
>10 years since surgery	33.9% (43)
Familial History of Alcohol Problems (N=113)	**% (N)**
One or Both Parents	51.2% (65)
Parent and/or Siblings	70.1% (89)
Parent and/or Sibling and/or Aunt/Uncle and/or Grandparent	85.8% (109)
History of Major Depressive Episode (N=79)	**% (N)**
Positive	33.6% (43)
Subclinical Episodes	17.2% (22)
Negative	10.9% (14)
History of Trauma (N=119)	**% (N)**
1+ Lifetime Traumatic Events	59.7% (71)
0 Traumatic Events	40.3% (48)

Figure 2

Current Weight x Height of Participants
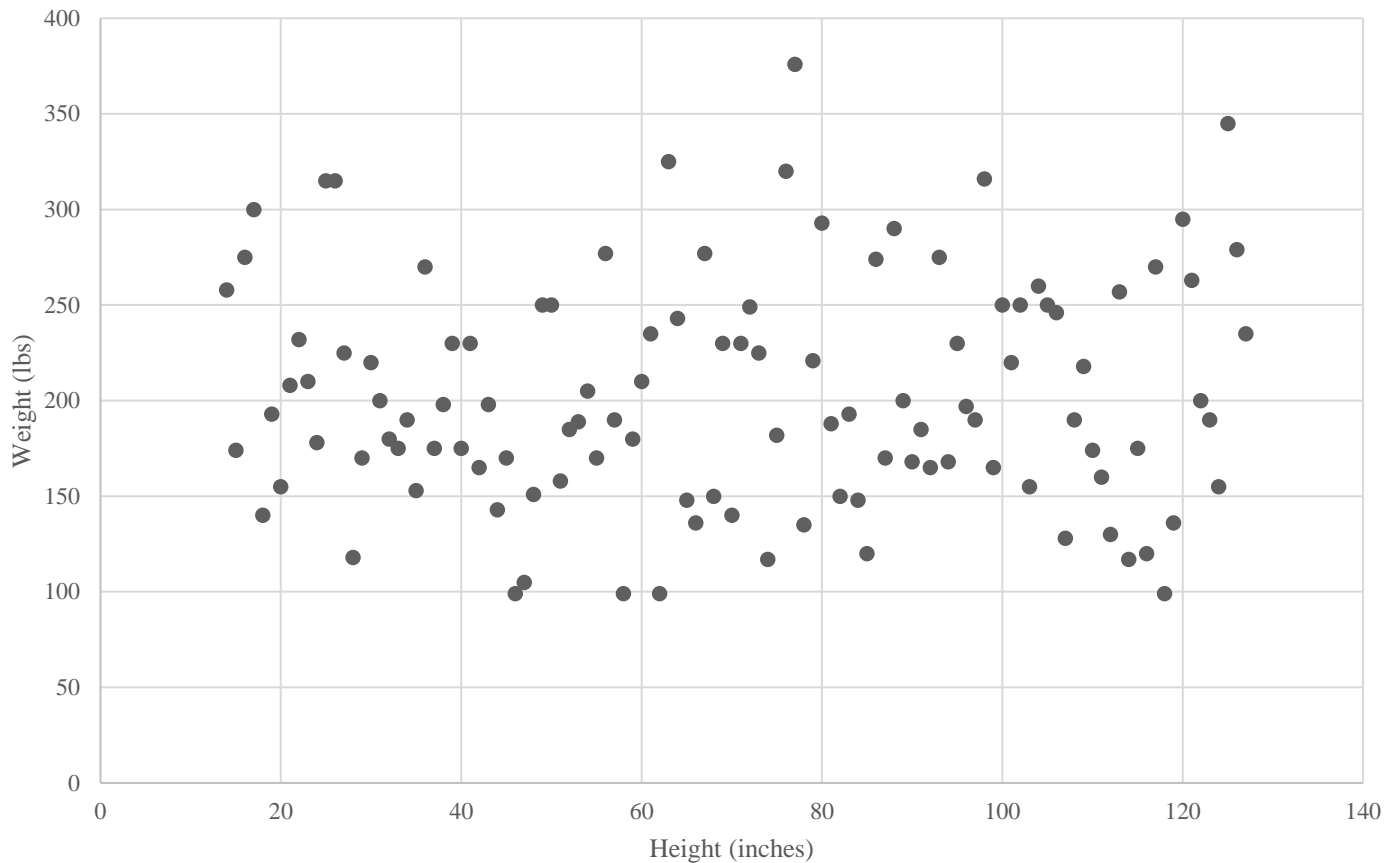
As illustrated in Figure 3, time elapsed since bariatric surgery ranged widely from 1 year – 41 years (13-493 months). The mean time elapsed since surgery was 102 months (SD=90.00) and 59.1% were between 1-8 years post-surgery. The majority (90.6%, N=115) of participants denied any major medical complications related to their surgery. Highest pre-surgical weight ranged widely from 180 pounds to 520 pounds with a mean of 309 pounds (SD = 72.15). Mean lowest post-surgery weight was 178 pounds (range of 92-300). On average, participants lost 131 pounds pre- to post-surgery (range 20-306 lbs.). Mean change in BMI pre- to post-surgery was 20.6 (range 3.54-50.08).

Figure 3

Time Elapsed Since Bariatric Surgery
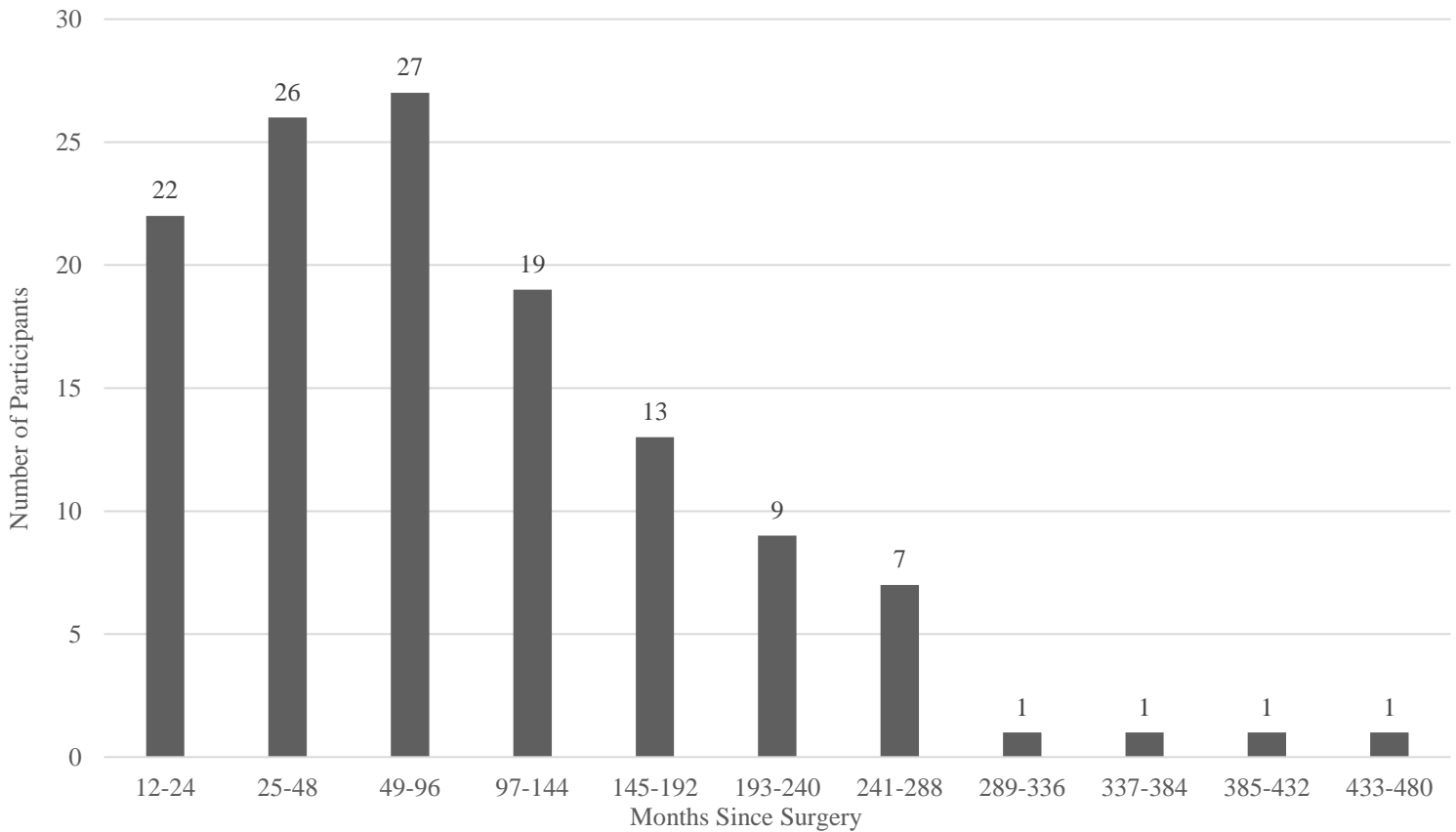
Specific Aim 1a: Substance use prevalence

Alcohol

As displayed in Table 2, nearly all participants (98.4%) endorsed consuming at least one full drink in their lifetime and almost half (47.2%) stated they had a period of regular drinking during their lifetime. Responses to the four CAGE items are also summarized in Table 2. Rates of endorsement ranged from 40% for "Have you ever felt you should cut down on your drinking?" to 19% for "Have you ever had a drink first thing in the morning to get rid of a hangover (eye-opener)?" One-third of the sample (33.6%) endorsed two or more CAGE items placing them at risk for problem drinking.

Table 2

History of Alcohol Use & Related Problems

	N	%
Any alcohol use (Lifetime)	123	98.4
Regular Alcohol Use (Lifetime)	60	47.2
Alcohol Problems (CAGE >2; Lifetime)	40	33.6
CAGE Item Responses (N=121)	N	%
Cut Down: *Have you ever felt you should cut down on your drinking?*	48	40.0
Annoyed: *Have people annoyed you by criticizing your drinking?*	26	21.5
Guilty: *Have you ever felt bad or guilty about your drinking?*	44	36.7
Eye-opener: *Have you ever had a drink first thing in the morning to get rid of a hangover (eye-opener)?*	23	19.0

Prior to surgery, during a typical month of their heaviest use, participants reported a mean of 7.89 drinking days (SD=9.79, range 0-30) with a mean of 3.42 (SD=4.01, range 0-30) drinks on an average drinking day. As seen in Table 3, number of binge drinking days (4+ drinks for females, 5+ drinks for males) per month during this period was 4.07. During a typical month of their heaviest use post-surgically, participants reported a mean of 6.11 drinking days (SD=8.24, range 0-30), 2.49 mean drinks (SD=3.24, range of 0-20) per drinking day, and 3.65 binge drinking days.

Table 3

Pre- & Post-Surgical Heavy Drinking Quantity and Frequency

	Quantity (Drinks per day)		Frequency (Drinking days per month)		Number of Binge Drinking Days	
	Mean	Median	Mean	Median	Mean	Median
Heaviest Pre-Surgical Drinking	3.42	2.50	7.89	3.00	4.07	1.00
Heaviest Post-Surgical Drinking	2.49	1.00	6.11	3.00	3.65	0.00

Tobacco Use & Dependence

As shown in Table 4, 37.3% (N=47) of participants reported consuming 100+ cigarettes in their lifetime. Similarly, 40.9% (N=52) of participants reported a lifetime history of daily cigarette smoking. Regular use of alternative tobacco products, such as e-cigarettes, chewing tobacco, or pipe tobacco, was reported by 25 individuals (19.7% of the sample). Among the 52 participants who reported daily smoking, mean cigarettes per day was 14.8 (SD=12.8, range from 1-60) during their heaviest period of tobacco use. Among daily smokers, 58% (N=29) reported they had never used tobacco products as an appetite suppressant or a weight management tool and just over one half of this group (52%, N=26) reported never having problems related to their tobacco consumption either before or after surgery.

Table 4

Tobacco, Caffeine & Other Drug Use

Lifetime Cigarette Consumption	
More than 100 cigarettes	37.3% (47)
Less than 100 cigarettes	21.4% (27)
Never tried a cigarette	41.3% (52)
Coffee Consumption (heaviest)	
Every day	62.1% (77)
5-6 days a week	9.7% (12)
3-4 days a week	6.5% (8)
1-2 days a week	6.5% (8)
Less than once a week	2.4% (3)
Not at all	12.9% (16)
Caffeinated Energy Drink Consumption (heaviest)	
Every day	21.8% (27)
5-6 days a week	5.6% (7)
3-4 days a week	8.9% (11)
1-2 days a week	5.6% (7)
Less than once a week	9.7% (12)
Not at all	48.4% (60)
Lifetime History of ≥6 Instances of Substance Use	
Marijuana	46.5% (59)
Prescription Opioids	22.8% (29)
Stimulants	15.7% (20)
Hallucinogens	14.9% (19)
Synthetics (e.g., K2/Spice, bath salts)	7.1% (9)
Heroin	4.7% (6)

Caffeine & Other Substance Use (Lifetime)

Heaviest lifetime consumption of caffeinated beverages in the form of coffee and energy drinks is summarized in Table 4. Almost two thirds of participants (60.6%, N=77) reported daily consumption of coffee during this period and 12.6% (N=16) reported never drinking coffee. More than half of participants (51.6%, N = 64) reported some consumption of caffeinated energy drinks during their heaviest period of caffeine consumption. Of these individuals, 42.2% (N=27) reported they consumed caffeinated energy drinks daily during their heaviest period of caffeine

consumption. For other drug use, also summarized in Table 4, marijuana was the most prevalent, with 46.5% (N=59) of participants reporting use 6+ times (lifetime). This was followed by prescription opioid misuse (22.8%, N=29) and stimulants (15.7%, N=20).

Specific Aim 1b: Hypothesis Testing

Outcomes for study hypotheses are summarized in Table 5. The first hypothesis, that males would have higher CAGE scores than female participants, was supported. Male participants had significantly higher CAGE scores when compared to female participants, $t(29.778)=3.19$, $p =.002$. The second hypothesis, that individuals who reported a lifetime history of daily smoking would have higher CAGE scores than those who did not report such a history, was also supported, with CAGE scores significantly higher in daily smokers as compared to less than daily and nonsmokers combined, $t(84.194)=-3.067$, $p=.001$. The third hypothesis, that individuals with a family history of alcohol problems would have higher CAGE scores than those without a family history, was partially supported. When family history was broadly defined to include biological siblings, grandparents, aunts, uncles, and parents, the two groups were not significantly different, $t(117) = -.977$, $p=.165$. However, those with one or both biological parents having an alcohol problem had significantly higher CAGE scores than those without such a history, $t(115.319) = -2.23$. $p = .014$. The fourth hypothesis, that individuals with at least 6 instances of cannabis use would have significantly higher CAGE scores than those without a history of cannabis use, was supported, $t(106.13) = -2.21$, $p = .015$. The fifth hypothesis, that individuals with a history of major depressive episodes would have significantly higher CAGE scores than those without a history of major depression, was not supported. There was no significant difference between these two groups, $t(69) = -.671$, $p = .252$. The final hypothesis, that individuals who endorsed exposure to at least one traumatic event would have higher CAGE

scores than those who endorsed zero traumatic events, was not supported. There was no

significant difference between CAGE scores in these two groups, t(111.66) = -.657, p = .249.

Table 5

CAGE Score Comparisons by Psychosocial Variables

	N	Mean	SD	df	t-value	p-value
Male	24	2.17	1.79	29.778	3.19	.002
Female	92	.92	1.31			
Daily Smoker	52	1.67	1.64	84.19	-3.07	.001
Non-Smokers & Non-Daily Smoker	71	.803	1.28			
6+ Lifetime Instances of Marijuana Use	54	1.48	1.58	106.13	-2.21	.015
>6 Lifetime Instances of Marijuana Use	65	.877	1.38			
Lifetime Trauma Exposure	71	1.23	1.59	111.66	-.657	.249
No Traumatic Events	48	1.04	1.34			
Parental Alcohol Use Problems	61	1.44	1.59	115.32	-2.22	.014
No Parental Alcohol Use Problems	58	.844	1.34			
Parent and/or Sibling Alcohol Use Problems	84	1.29	1.59	117	-1.76	.049
No Parental or Sibling Alcohol Use Problems	35	.800	1.35			
Family History of Alcohol Use Problems	102	1.206	1.185	117	-.977	.165
No Family History of Alcohol Use Problems	17	.824	1.537			
History of Major Depressive Episodes	40	1.30	1.54	69	-.671	.252
No History of Depressive Episodes	31	1.06	1.36			

Specific Aim 2: SPQ prevalence of addictive behaviors

Alcohol

SPQ Alcohol subscale item scores for the N=118 participants who endorsed any alcohol

use (lifetime) are summarized in Table 6 and Figure 4. The item with the highest mean score

(2.20) across participants was "I had a good head for alcohol so that others appeared to get drunk more readily than I did." This item along with "I have found it strange to leave half a glass of (alcoholic) drink" both had the highest median score of 2.0. As seen in Table 7, 20.3% (N=24) of individuals surveyed had scores indicating clinically significant problems related to alcohol use.

Table 6

SPQ Alcohol Subscale Item Scores

Likert Scale from 0 = not at all like me to 5 = very much like me

	Median	Mean Score	SD
I have found that feeling light-headed has often been irrelevant in deciding when to stop drinking alcohol	1.00	1.74	1.80
I have found that having one drink tended not to satisfy me but made me want more	1.50	2.13	1.95
I have had a complete blank of ten minutes or more in my memory when trying to recall what I was doing after drinking alcohol on the previous day or night	.00	1.42	1.86
I have used alcohol as both a comfort and a strength	1.00	2.04	1.96
I have tended to gulp down the first (alcoholic) drink fairly fast	1.00	1.83	2.01
I had a good head for alcohol so that others appeared to get drunk more readily than I did	2.00	2.20	1.85
I have found it strange to leave half a glass of (alcoholic) drink	2.00	2.07	1.97
I have been irritable and impatient if there has been more than ten minutes of conversation at a meal or social function before my host offers me an alcoholic drink	.00	0.72	1.48
I have deliberately had an alcoholic drink before going out to a place where alcohol may not be available	.00	1.41	1.92
I have often drunk significantly more alcohol than I intended to	1.00	1.94	1.93
Total Score (Range 0-50)	15.00	17.69	14.58

Figure 4

SPQ Alcohol Item Responses

■ 0 - Not at all like me   ■ 1   ■ 2   ■ 3   ■ 4   ■ 5 - Very much like me

Table 7

Clinically Significant SPQ Scores for Substance Use

	N	%
Alcohol	24	20.3
Tobacco	6	13.6
Caffeine	38	38.8
Substance Use	22	31.4

Tobacco

SPQ Tobacco subscale items from the N=55 participants who endorsed regular use of tobacco products or smoked 100+ cigarettes are summarized in Table 8. The item with the highest mean score (3.50) was "I have preferred to use nicotine throughout the day rather than only at specific times." The two items with the highest median score (4.0) were "I have deliberately I have deliberately used nicotine before going out to a place where I may not be able to use it" and "I have often used nicotine to calm my nerves." Items with the lowest mean scores (1.78) were "I have often found that having my first use of nicotine in any day tends not to satisfy me but made me want more" and "I have found that my nicotine consumption goes up or down when I am off alcohol or drugs or when I am on a diet." As shown in Table 11, 13.6% (N=6) had scores that indicated clinically significant tobacco use and related problems.
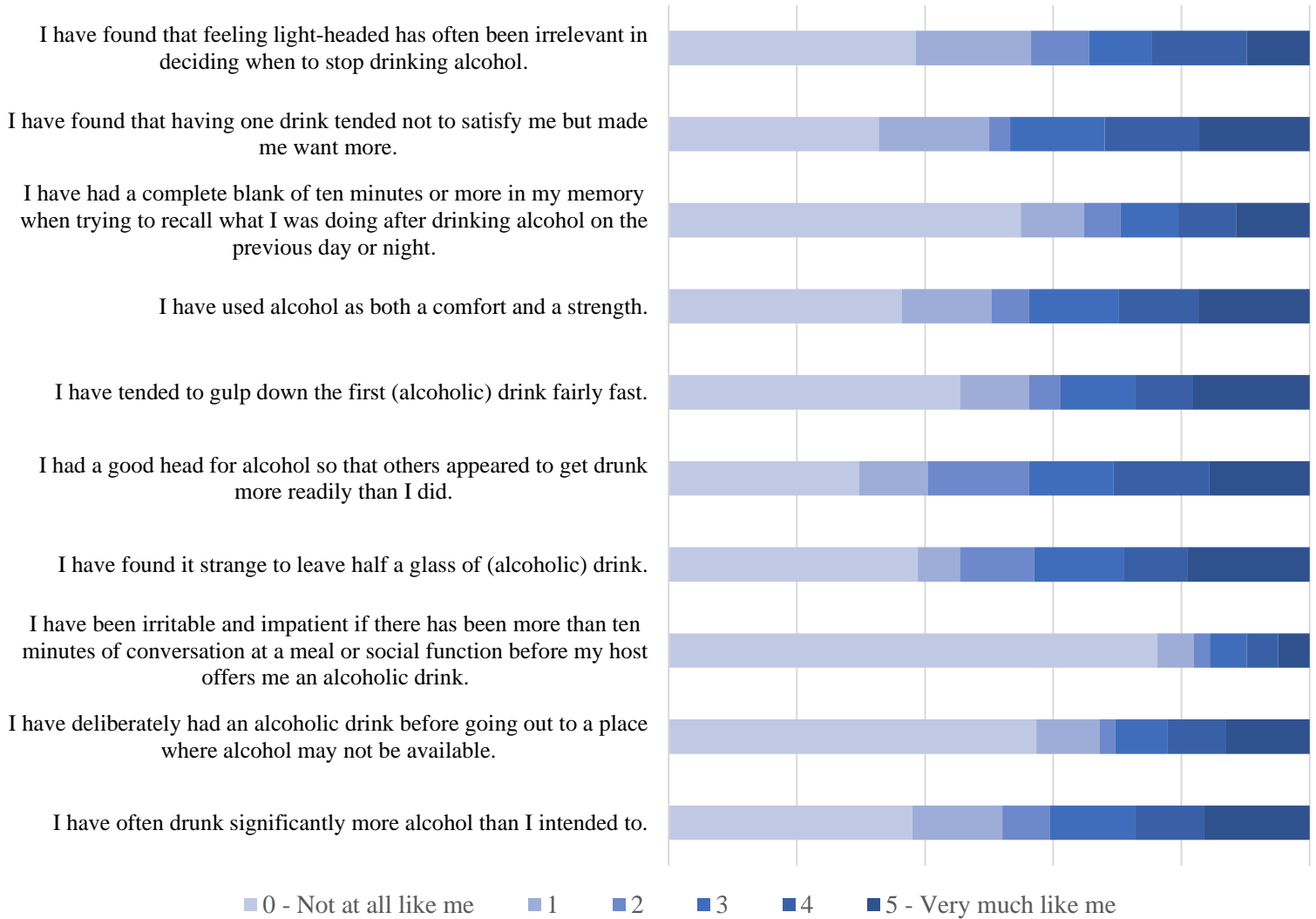
Table 8

SPQ Tobacco Subscale Item Scores

Likert Scale from 0 = not at all like me to 5 = very much like me

	Median	Mean Score	SD
I have preferred to use nicotine throughout the day rather than only at specific times.	3.50	3.10	1.93
I have tended to use nicotine as both a comfort and a strength even when I feel that I did not want any.	3.00	3.00	1.85
I have been afraid that I will put on excessive amounts of weight or become particularly irritable or depressed if I give up using nicotine altogether.	1.00	1.94	2.11
I have often found that having my first use of nicotine in any day tends not to satisfy me but made me want more.	1.00	1.78	1.84
I have continued to use nicotine even when I have had a bad cold or even more serious respiratory problems.	2.50	2.38	2.03

I have found that my nicotine consumption goes up or down when I am off alcohol or drugs or when I am on a diet.	1.00	1.78	2.00
I have deliberately used nicotine before going out to a place where I may not be able to use it.	4.00	3.04	2.05
When I ran out of my favorite form of nicotine, I have accepted the offer of an alternative that I do not particularly like.	3.00	2.39	1.92
I have often used nicotine to calm my nerves	4.00	3.08	1.89
I have often used nicotine significantly more than I intended to.	3.00	2.75	1.97
Total Score (Range 0-50)	29.00	24.82	15.95

Caffeine

SPQ Caffeine subscale item responses from the N=101 individuals who reported consuming caffeinated beverages five or more times each week are summarized in Table 9. The item with the highest mean score (2.07) was "I have had an intimate relationship with caffeine so that in a strange way I have felt that I became a real person only when I used it." This item also had the highest median score (2.0). The item with the lowest mean score (0.23) among participants was "I have regularly stolen or helped myself to other people's caffeine even though I had enough money to buy my own." For all items except for "I have had an intimate relationship with caffeine so that in a strange way I have felt that I became a real person only when I used it" had a median score of 0. As seen in Table 7, 38.8% of individuals had SPQ caffeine subscale scores indicating clinically significant caffeine use and related problems.

Table 9

SPQ Caffeine Subscale Item Scores

Likert Scale from 0 = not at all like me to 5 = very much like me

	Median	Mean Score	SD
I have had an intimate relationship with caffeine so that in a strange way I have felt that I became a real person only when I used it.	2.00	2.07	1.95
I have preferred to take caffeine on my own rather than in company.	.00	1.51	1.86
I have felt it would be more painful for me to give up caffeine than to give up a close friendship.	.00	1.11	1.58
I have regularly stolen or helped myself to other people's caffeine even though I had enough money to buy my own.	.00	0.23	0.79
I have tended to time my intake of caffeine so that others are not really aware of my total intake	.00	0.70	1.51
I have had a sense of increased tension and excitement when I buy caffeinated substances or when I see advertisements for them	.00	0.94	1.55
I have found that my intake of another form of caffeine tends to increase when I am off my own favorite	.00	0.89	1.50
When I have used too much caffeine, I have tended to feel defiant as well as disappointed in myself	.00	0.63	1.29
I have sometimes rushed through a meal, or skipped it altogether, so that I can have some caffeine	.00	0.68	1.44
I have often been capable of drinking 20 cups of tea or coffee or caffeinated soda	.00	1.08	1.59
Total Score (Range 0-50)	5.00	9.60	10.17

Other Substances

For other drugs, SPQ items were completed by the 72 participants that endorsed use of at least one class of drug six or more times over their lifetime. Item responses are summarized in Table 10. The item with the highest mean and median score (2.0) score was "I have tended to use drugs as both a comfort and a strength." For the majority of items (7/10), the median score was 0. The item with the lowest mean score (.82) was "If I had run out of my usual or preferred substance, I would take an alternative even if I was not sure about its effects." As seen in Table 7, 31.4% of these individuals scored in the clinically significant range for substance use and related problems on the SPQ substance use subscale.

Table 10

SPQ Substance Use Subscale Item Scores

Likert Scale from 0 = not at all like me to 5 = very much like me

	Median	Mean Score	SD
I have particularly enjoyed getting a really strong effect from drugs	1.00	2.04	1.95
I have had a sense of increased tension and excitement when I knew that I had the opportunity to get some drugs	1.00	1.68	1.89
Other people have expressed repeated serious concern about some aspects of my drug use	.00	1.01	1.79
I have found that getting high tends to result in my going on to take more drugs	.00	1.10	1.72
I have tended to use drugs as both a comfort and a strength	2.00	2.06	1.93
I have often found that I use all of the drugs in my possession even thought I had intended to spread them out over several occasions	.00	1.13	1.77
I have tended to make sure that I have the drugs or the money for drugs before concentrating on other things	.00	0.99	1.73
I have been irritable or impatient if my supply of drugs is delayed for 10 minutes or so for no good reason	.00	0.88	1.68

I have tended to use more drugs if I have more	.00	1.32	1.89
I have deliberately used drugs before going out for a time if I felt there might not be the opportunity to use them later	.00	1.44	1.99
I have often found myself taking more drugs than I intended to	.00	1.35	1.81
If I had run out of my usual or preferred substance, I would take an alternative even if I was not sure about its effects	.00	0.82	1.49
SPQ Drug Total Score (Range 0-50)	6.5	13.66	15.98

Behavioral Addictions

The percentage of participants screening positive for problems with a given behavior are summarized in Table 11. Screening items are listed in the survey (see Appendix B). Problems were most common for food bingeing (77.9%, N=95), followed by food restriction (51.6%, N=63). Gambling had the lowest screen positive rates with only 4 participants (3.4%) meeting the criterion, followed by exercise with only 8 participants (7.0%) meeting the criterion.

Table 11

Addictive Behavior Positive Screening

Behavior	N	%
Food Bingeing	95	77.9
Food Starving	63	51.6
Shopping	55	45.8
Gambling	4	3.4
Sexual Behavior	13	11.0
Work	35	29.9
Exercise	8	7.0

For each behavior, when the screen positive individual subsequently completed the SPQ, rates of clinically significant SPQ scale scores are shown in Table 12. Percent positive rates varied widely, ranging from only 6.7% for food starving and 13.6% for tobacco, to 100% for gambling and exercise.

Table 12

Clinically Significant SPQ Scores for Addictive Behaviors

Gambling	4	100
Exercise	8	100
Shopping	44	77.2
Work	10	29.4
Sexual Behavior	9	81.8
Food Bingeing	72	79.1
Food Starving	4	6.7

Specific Aim 3: Validation of SPQ Alcohol.

Among participants (N=121) who endorsed consuming at least one full alcohol beverage in their lifetime, 118 individuals completed all SPQ Alcohol subscale questions and the CAGE. As hypothesized, individuals with clinically elevated CAGE scores ($\geq$2) had higher SPQ alcohol subscale scores than those with non-elevated scores (0-1) on those measures. Mean SPQ alcohol subscale score was 33.16 (SD=10.27) among individuals with clinically elevated CAGE scores ($\geq$2) and those with non-elevated CAGE scores (0-1) had a mean SPQ subscale score of 9.89 (SD=9.27), $t(112)$=-12.107, $p<.001$.

Individuals with CAGE scores $\geq$2 had higher scores than CAGE <2 scores across all 10 SPQ alcohol items (all $p <.001$; see Figure 5). The item with the largest mean difference was "I have used alcohol as both a comfort and a strength." Also as hypothesized, total SPQ alcohol

domain scores were higher for individuals endorsing each individual CAGE item compared to those answering no (p <.001; see Table 13).

Figure 5

SPQ Alcohol Subscale Item Scores
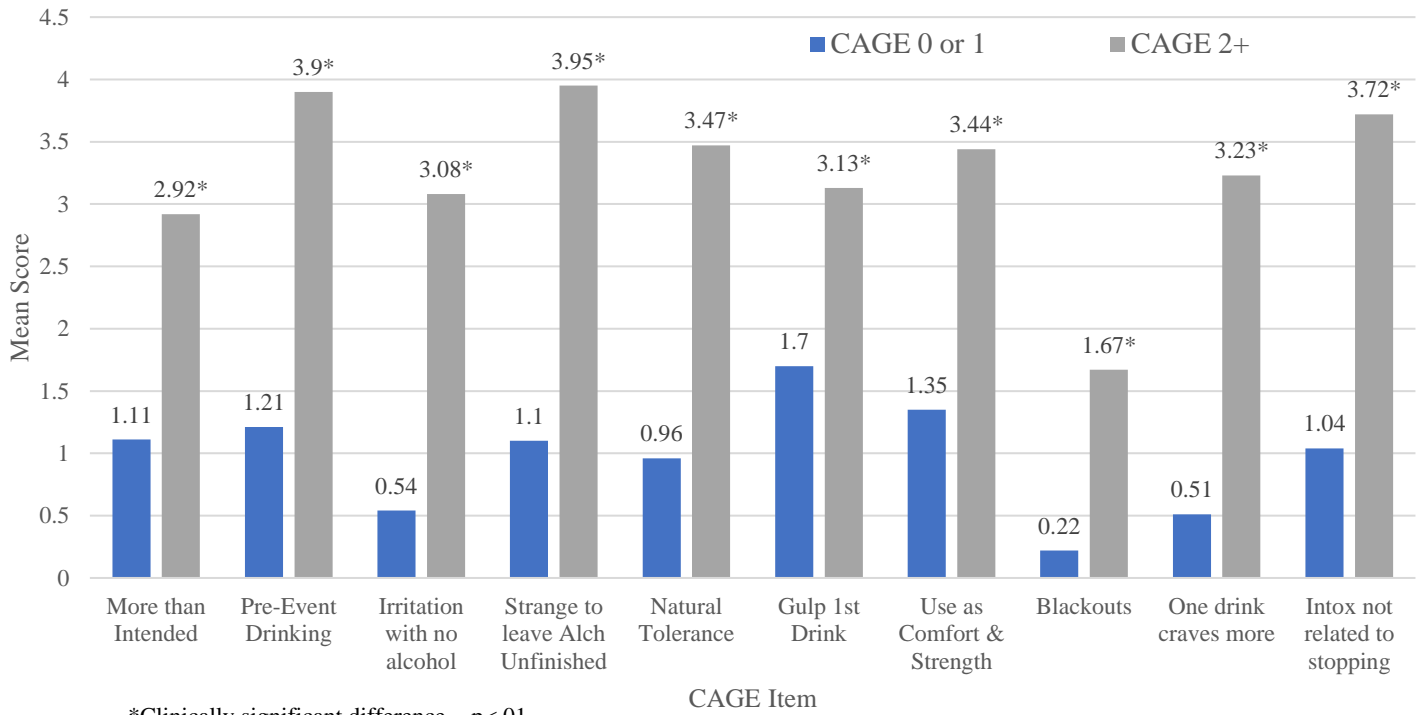
*Clinically significant difference - p<.01

Table 13

Comparison of SPQ Alcohol Subscale Scores Across CAGE Item Responses

CAGE Item	CAGE Response	N	%	SPQ Alc Mean Score	SD	t	df	p
Cut Down	Yes	45	39.13	29.73	12.33	-9.49	75.97	<.001
	No	70	60.87	9.30	9.36			
Annoyed	Yes	25	21.55	37.20	6.34	-14.72	67.64	<.001
	No	91	78.45	11.97	10.99			
Guilty	Yes	42	36.52	30.38	11.92	-9.67	113	<.001
	No	73	63.48	10.18	10.08			
Eye-Opener	Yes	23	19.83	37.65	6.25	-14.42	62.09	<.001
	No	93	80.17	12.39	11.28			

SPQ alcohol subscale scores were positively correlated with pre-surgical drinking frequency r(116)=.526, p<.001, and post-surgical drinking frequency, r(118)=.459, p<.001. SPQ alcohol scores were also positively correlated with number of drinks per day both pre-surgery (r(115)=.467, p<.001) and post-surgery (r(117)=.540, p<.001). The SPQ alcohol subscale score was most strongly correlated with CAGE total score (r(114)=.819, p<.001) compared to other measures of alcohol use quantity, frequency, and related problems. Finally, participants who reported having lifetime history of alcohol problems had significantly higher SPQ alcohol subscale scores (t(113)=15.24, p <.001) and CAGE scores (t(43.35)=12.308, p<.001) when compared to those who denied such problems.

Specific Aim 4: Explore post-surgical changes

Alcohol

Heaviest Drinking Estimates Pre- and Post-Surgery. As shown in Table 14, during their heaviest period of drinking pre-surgically, participants reported consuming alcohol 7.89 days per month (mean) and consuming on average 3.42 drinks per drinking day for a total of 48.8 mean drinks per month. Post-surgically, during their heaviest period of alcohol use, mean frequency of drinking was 6.16 days and 2.52 drinks per day for a mean total of 30.95 drinks per month. Mean drinking frequency was not significantly different when pre- and post-surgical values were compared (7.89 vs 6.16; p=.078), but mean drinking quantity was significantly smaller pre-surgically compared to post-surgically (3.42 vs 2.52; p=.019). Next, each participant's pre-surgery heaviest use data were compared to that person's post-surgery heaviest alcohol use data and results are summarized in Table 15. For frequency, pre-surgery values were higher than post-surgery values for nearly half of the sample (45.5%), with one-third having the reverse (post-surgery > pre-surgery). A similar pattern was seen for quantity of use with more

than half (56.3%) having higher amounts pre-surgery than post-surgery. Nearly one fourth had

the reverse (post-surgery > pre-surgery) and the remainder having no change in drinking

quantity.

Table 14

Quantity & Frequency Measures for Heaviest Drinking Period Pre- & Post-Surgery

		N	Mean	SD	t	df	p
Drinking Days	Pre-surgery	123	7.89	9.79	1.775	122	.078
	Post-surgery	123	6.16	8.28			
Typical Drinks per Day	Pre-surgery	122	3.42	4.01	2.383	121	.019
	Post-surgery	122	2.52	3.26			
Number of Binge Drinking Days	Pre-surgery	115	4.11	7.09	1.639	121	.749
	Post-surgery	115	3.81	7.75			
Calculated Total Drinks per Month	Pre-surgery	122	48.18	112.35	.321	114	.104
	Post-surgery	122	30.95	76.23			

Table 15

Comparisons of Pre- & Post-Surgery Heaviest Drinking Variables

	N	%
Frequency of Use (days/month) (N=123)		
Post-surgery > Pre-surgery	40	32.5
Post-surgery < Pre-surgery	56	45.5
Post-surgery = Pre-surgery	27	21.9
Quantity per Drinking Day (N=119)		
Post-surgery > Pre-surgery	26	21.8
Post-surgery < Pre-surgery	67	56.3
Post-surgery = Pre-surgery	26	21.8
Frequency of Binge Drinking (days/month) (N=127)		
Post-surgery > Pre-surgery	32	25.2
Post-surgery < Pre-surgery	39	30.7
Post-surgery = Pre-surgery	56	44.1

Participant Perception of Changes in Alcohol Use Pre- and Post-Surgery. When individuals were asked to think about their overall drinking pre- and post-surgery and indicate their perceptions of change in alcohol consumption after surgery, 43% (N=52) reported a decrease post-surgery. In contrast, 26.4% (N=32) reported an increase in alcohol consumption. As shown in Table 16, more than half (53.3%, N=49) of participants reported that their alcohol sensitivity increased post-surgery. While the large majority of participants (71.7%, N=86) denied ever having a problem related to their alcohol consumption, 11.7% (N=14) of those surveyed reported problems related to alcohol only before surgery. A similar number (N=15, 12.5%) reported alcohol related problems only after surgery.

Table 16

Perception of Substance Use and Related Problems Pre- to Post-Surgery

	N	%
Alcohol Sensitivity (N=92)		
Sensitivity increased post-surgery	49	53.3
Sensitivity decreased post-surgery	11	8.6
Sensitivity did not change	32	34.8
Perception of Alcohol Consumption (N=121)		
Increased after surgery	32	26.4
Decreased after surgery	52	43.0
No change	37	30.6
Perception of Alcohol Problems (N=120)		
Problem only before surgery	14	11.7
Problem only after surgery	15	12.5
Problems both before and after surgery	5	4.2
No history of problems	86	71.7
Perception of Change in Tobacco Consumption (N=50)		
Increased after surgery	11	22.0
Decreased after surgery	18	36.0
No change	21	42.0

Use of Tobacco as Weight/Appetite Management (N=50)		
Only before surgery	12	24.0
Only after surgery	1	2.0
Both before and after surgery	8	16.0
Never	29	58.0
Perception of Tobacco Related Problems (N=50)		
Problem only before surgery	14	28.0
Problem only after surgery	2	4.0
Problems both before and after surgery	8	16.0
No history of problems	26	52.0
Perception of Change in Caffeine Consumption (N=101)		
Increased after surgery	21	20.8
Decreased after surgery	30	29.7
No change	50	49.5
Perception of Caffeine Related Problems (N=102)		
Problem only before surgery	8	7.8
Problem only after surgery	10	9.8
Problems both before and after surgery	27	26.5
No history of problems	57	55.9
Perception of Change in Substance Use (N=71)		
Increased after surgery	16	22.5
Decreased after surgery	13	18.3
No change	42	59.2
Perception of Substance Related Problems (N=72)		
Problem only before surgery	3	4.2
Problem only after surgery	9	12.5
Problems both before and after surgery	7	9.7
No history of problems	53	73.6

Alcohol Consumption & Time Elapsed Since Surgery. Associations between heaviest

alcohol use variables and time post-surgery were examined in two ways; with post-surgery time

as a continuous measure (Table 17) and with time post-surgery dichotomized into 1-10 years

post-surgery and >10 years post-surgery (Table 18). When time post-surgery was continuous, no

significant Pearson correlations were found with SPQ alcohol subscale scores or heaviest

quantity and frequency measures. Similarly, when time post-surgery was dichotomized, t-test

comparisons of SPQ alcohol scores and heaviest drinking measures in the 1-10 vs >10 groups,

no significant differences were found (all p > .05).

Table 17

Time Since Surgery by Alcohol Variables

	Time (months) since surgery		
	r*	N	p
SPQ Alcohol Subscale Score	-.106	116	.253
Post-Surgical Drinking Days	.003	123	.974
Post-Surgical Average Drinks Per Day	.125	122	.171
Number of Binge Drinking Days Per Month	.114	119	.217

*Pearson's correlations

Table 18

Alcohol Variable Comparisons: Participants <10 Years vs 1-10 Years from Surgery

		N	Mean	SD	t	df	p
SPQ Alcohol Subscale Scores	1-10 Years	80	19.50	15.09	1.79	114	.077
	>10 Years	36	14.31	13.01			
Post-Surgical Drinking Days	1-10 Years	84	6.25	8.11	.139	121	.890
	>10 Years	39	6.03	8.76			
Average Drinks Per Day	1-10 Years	84	2.25	2.81	.172	120	.167
	>10 Years	38	3.13	4.05			
Number of Binge Drinking Days Per Month	1-10 years	82	3.23	6.76	.080	117	.342
	>10 years	37	4.68	9.34			

Other Substances

Of those who reported lifetime history of regular use of cigarettes or alternative tobacco products, approximately half (52.0%, N=26) denied any problems related to their tobacco use. Less than half of participants (42%, N=21) reported ever (pre- or post-surgically) using cigarettes as a weight or appetite management tool. Similarly, 42% (N=21) of participants reported their tobacco use did not change after surgery. However, 22% (N=11) reported an increase in tobacco consumption post-surgery and 36.0% (N=18) stated their tobacco consumption decreased. As seen in Table 15, among participants who reported consumption of caffeinated beverages (coffee, caffeinated tea, caffeinated energy drinks) at least 5 times weekly and were asked additional questions about their caffeine consumption and related problems (N=102), about half (49.5%, N=50) stated that their caffeine consumption did not change post-surgically. More than half of participants (55.9%, N=57) stated they did not feel they ever had problems related to their consumption of caffeine. However, a small group of participants (N=10, 9.8%) reported they had caffeine related problems only after surgery. Of those who endorsed at least 6 instances of consuming any one substance 6+ times (N=72), the majority of patients (N=42, 59.2%) reported no perceived changes in substance use behaviors after surgery (see Table 15). However, among those who did report a change in substance use (N=30), more than half of those (N=16) stated their substance use increased post-surgically. Nearly three-fourths of participants (73.6%, N=53) stated they never felt they had a problem related to their substance use and N=9 (12.5%) reported they had substance use problems only after surgery.

Behavioral Addictions

Participant perceptions of post-surgical changes in intensity or frequency of addictive behaviors can be found in Table 19. Shopping was the most commonly reported addictive

behavior with N=54 screening positive for lifetime history of problematic or uncontrollable

shopping. Two-fifths of these individuals (40.7%, N=22) perceived the frequency and/or

intensity of their problematic shopping increased post-surgery. Only a small number of

participants screened positive for lifetime history of problem gambling (N=4), lifetime history of

excessive exercise (N=8), and excessive sexual behaviors (N=13) and therefore went on to

complete survey questions. The majority of participants who were deemed eligible for gambling

survey items. (75%, N=3) reported no perceived change in gambling behaviors pre- to post-

surgery. Half (50%, N=2) stated that they felt they never had problems related to their gambling,

pre- or post-surgery. Among respondents who screened positive for a history of problematic

exercise behavior, 50% (N=4) reported they perceived they exhibited problematic exercise

behavior only before surgery. Almost half of individuals (46.2%) eligible to by surveyed about

sexual behavior reported they did not believe behavior changed in frequency or intensity post-

surgery. Among the 34 individuals who were considered eligible to complete questionnaires

related to excessive or problematic work behaviors, the majority stated that, from their

perception, these behaviors did not change post-surgery (58%, N=20) and were problematic both

before and after surgery (65.7%, N=23).

Table 19

Perception of Addictive Behaviors and Related Problems Pre- to Post-Surgery

	N	%
Perception of Change in Gambling Behaviors (N=4)		
Increased After Surgery	1	25
Decreased After Surgery	0	0
No Change	3	75

Perception of Gambling Problems (N=4)		
Problem only before surgery	0	0
Problem only after surgery	0	0
Problems both before and after surgery	2	50.0
No history of problems	2	50.0
Perception of Change in Shopping Behaviors (N=54)		
Increased after surgery	22	40.7
Decreased after surgery	5	9.3
No change	27	50
Perception of Shopping Problems (N=55)		
Problem only before surgery	5	9.1
Problem only after surgery	9	16.4
Problems both before and after surgery	29	52.7
No history of problems	12	9.4
Perception of Change in Exercise Behavior (N=8)		
Increase after surgery	3	37.5
Decreased after surgery	3	37.5
No change	2	25.0
Perception of Exercise Related Problems (N=9)		
Problem only before surgery	4	50.0
Problem only after surgery	2	25.0
Problems both before and after surgery	1	12.5
No history of problems	1	12.5
Perception of Change in Sexual Behavior (N=13)		
Increased after surgery	6	46.2
Decreased after surgery	4	30.8
No change	3	23.1
Perception of Sexual Behavior Related Problems (N=12)		
Problem only before surgery	4	33.3
Problem only after surgery	4	33.3
Problems both before and after surgery	3	25.0
No history of problems	1	8.3

Perception of Change in Problematic Work Behaviors (N=34)		
Increased after surgery	7	20.6
Decreased after surgery	7	20.6
No change	20	58.8
Perception of Work Related Problems (N=34)		
Problem only before surgery	5	14.3
Problem only after surgery	2	5.7
Problems both before and after surgery	23	65.7
No history of problems	5	14.3

Discussion

Summary of Findings

Previous studies of addictive behaviors among bariatric surgery patients have focused on a period prior to surgery or a few years post-surgically leading to a gap in our understanding of long term post-surgical changes. The present study examined addictive behaviors among individuals with a history of bariatric surgery in order to establish prevalence data and correlates of substance use and related problems, to explore post-surgical changes of substance use and addictive behaviors, and to examine the validity of the SPQ for measuring addictive behaviors in a bariatric sample. To our knowledge, following an extensive search of the relevant scientific literature, this is one of the first studies to examine substance use and addictive behavior data in a sample that includes individuals >5 years post-bariatric surgery. Previous studies of bariatric surgery patients are limited by lack of follow-up data after one or two years post-surgery due to limits of medical follow up, leaving a large gap in our understanding of patient experiences after bariatric surgery.

Alcohol related problems were more prevalent in our sample when compared to other studies of bariatric surgery patients. As expected, the present study found the following factors were associated with alcohol use and related problems (e.g., family history, male gender, history of depression) similar to those previously reported in the literature. The SPQ, a measure previously unstudied in a bariatric sample, was used to assess problems related to a variety of potentially addictive behaviors. The SPQ Alcohol Subscale was strongly correlated with CAGE scores and standard alcohol quantity and frequency measures, suggesting that this relatively unknown measure may be an accurate measurement tool for clinically significant alcohol

problems in patients with a history of bariatric surgery. Finally, SPQ responses regarding the

frequency of problems related to potentially addictive behaviors extended our knowledge of

comorbid addiction in bariatric surgery patients.

Alcohol Use and Related Problems

The present study found alcohol problems to be more prevalent than those previous

reported in the literature, which range from 7%-28% (Buffington, 2007; King et al., 2012, 2017).

In this sample, prevalence of alcohol problems was at or above previous estimates according to

all measures; 33.6% (N=40) of individuals had elevated CAGE scores (>2), 20.3% (N=24) had

clinically significant alcohol use problems according to the SPQ Alcohol Subscale, and 28.3%

(N=34) reported they had a lifetime history of problems related to alcohol consumption.

Additionally, 72.7% (N=88) reported at least one lifetime instance of alcohol consumption at a

hazardous level (6+ drinks in one instance) which is elevated in comparison to lifetime

prevalence in the general population (approximately 50%) (NIAAA, 2014) and significantly

higher than previous reports among bariatric patients. For instance, King et al. (2012) surveyed

approximately 2,500 bariatric surgery patients on past-year alcohol consumption at three time

points: pre-operatively, one-year post-operatively, and two years post-operatively. Authors found

that 19.6% (N=266) reported at least one instance of hazardous alcohol consumption pre-

operatively, 13.3% (N=180) one year post-operatively, and 15.6% (N=224) two years post-

operatively. While these results cannot be directly compared due to differences in timeframes

surveyed, present findings indicate a potentially heightened prevalence compared to other

estimates. A possible explanation for heightened prevalence is that the King et al.'s (2012) study

was conducted within the surgical approval and medical follow-up process, which may lead

individuals to minimize problematic substance use due to social desirability bias. Hazardous

substance use can be a contraindication for bariatric surgery approval and previous researchers have suggested patients downplay factors that may lead to patients not receiving approval for bariatric surgery (King et al., 2017; 2012). The present study's independence from bariatric surgery providers and the medical system at large may provide a more accurate snapshot of alcohol use patterns.

In the current study, 53.3% (N=49) of participants reported they felt they were more sensitive to the effects of alcohol post-surgery, a phenomenon that has been previously documented in bariatric populations (Jones et al., 2002; Maluenda et al., 2010) which is likely related to the changes in the bodies' ability to absorb alcohol post-surgery (Acevedo et al., 2018; Sarwer & Heinberg, 2020). Overall, there was a significant decrease in both mean number of drinking days and drinks per day in the sample post-surgically. Previous research has documented a trend among bariatric surgery patients where substance use initially decreases post-surgically, and subsequently increases past population rates in the years after surgery (King et al., 2017; 2012). However, our data only collected one time point of post-surgical drinking, which prevents us from being able to confirm or refute this longitudinal trend. Additionally, only 19% (N=24) had no change in drinking frequency and 21.8% (N=26) had no change in drinking quantity. In contrast, a previous meta-analysis found between 60-70% of bariatric patients reported no change in alcohol consumption patterns pre- to post-surgery (Ertelt et al., 2008). Therefore, current study findings suggest that surgery may impact patient drinking patterns more often than previously thought.

Correlates of Alcohol Use. Given the unique impact of bariatric surgery on alcohol consumption and its effects, the present study also sought to investigate factors that may be associated with alcohol problems in the bariatric population. Depression, family history of

alcohol use disorder (AUD), other substance use, and trauma exposure are well documented as

risk factors for AUD in the general population (Aneshensel & Huba, 1983; Cutler & Nolen-

Hoeksema, 1991; Hartka et al., 1991; Heath, 1995; Heath & Martin, 1994; Kaprio et al., 1992;

Kilpatrick et al., 2000; Olenick & Chalmers, 1991; Prescott et al., 1994) and gender moderates

AUD risk. However, there is limited research confirming these factors as risk factors for

problematic alcohol use in the bariatric surgery population specifically. The present study

assessed associations between these factors (gender, trauma exposure, smoking history,

marijuana use, history of major depression, family history of alcohol problems) and CAGE

scores. As expected, CAGE alcohol subscale scores were significantly higher for individuals

with a parental history of AUD, history of cannabis use, history of daily smoking, and males.

Somewhat surprising was the absence of an association with a history of major depression and

traumatic event exposure, despite these being well documented risk factors for AUD in the

general population. This may be due to a sample size but could be due to the measures used. The

BTQ includes a wide variety of traumatic events and does not measure response to event or

symptoms of post-traumatic stress. In previous studies, specific kinds of trauma, such as sexual

trauma, have been found to be particularly potent risk factors for negative post-surgical outcomes

in bariatric populations (Steinig et al., 2012). Further examination using tools that measures post-

traumatic symptoms and more targeted traumatic events may provide greater clarity regarding

how trauma and alcohol use are related among bariatric surgery patients.

Validation of SPQ Alcohol. While there was little to no existing literature validating the

use of the SPQ and the CAGE in bariatric surgery patients, previous validation studies have

found them to be valid measures of alcohol use problems among general population samples,

substance use samples, primary care patient samples, and hospital patient samples (Castells &

Furlanetto, 2005; Dhalla & Kopec, 2007; Malet et al., 2005; Pilowsky & Wu, 2012). Our results

suggest that both the SPQ alcohol subscale and the CAGE can adequately detect and measure

alcohol use and related problems in bariatric surgery patients as well. SPQ subscale scores were

strongly correlated with both pre- and post-surgical alcohol quantity and frequency variables as

well as CAGE scores. When individuals were asked to categorize their own alcohol use and

problems, those who endorsed a history of alcohol problems had significantly higher SPQ

alcohol subscale scores than those who denied a history of such problems. While these results are

promising, a full validation study was not conducted in the present study, meaning the measures

still warrant further scrutiny. Given the unique biological and psychosocial factors involved

when patients drink alcohol post bariatric surgery, it is important to carefully consider the

measures used to assess substance use in this population.

Other Substances and Related Problems

One third of participants smoked 100+ cigarettes (lifetime; 37.3%) which is lower than

previous reports in bariatric samples (e.g., 45%; Delgado-Rodríguez et al., 2003). However,

cigarette smoking has declined substantially in the general population since 2003 so it is

reasonable to think there is a similar decrease among bariatric patients. Similarly, 40.9% of

participants reported a lifetime history of daily cigarette smoking, which is also on the low range

of regular cigarette use prevalence seen in bariatric samples (40-67%; Delgado-Rodríguez et al.,

2003). The slight discrepancy in participants reporting a history of daily smoking (N=52) and

those reporting smoking 100+ cigarettes (lifetime; N=47) may be due to a number of participants

being recent smokers, or daily smokers for only a brief period of time. Not only is cigarette use a

concern in bariatric patients because of the health implications, but the link between smoking

and body weight may change tobacco use behavior in bariatric patients. Smoking is commonly

viewed as an appetite suppressant/weight control tool, and for many smokers, weight gain is a

concern that can hinder smoking cessation (Meyers et al., 1997). Despite this, less than half of

participants with a history of regular smoking reported using cigarettes or other tobacco products

as an appetite suppressant or weight management tool either before or after surgery (42%). For

tobacco, caffeine, and substance use, individuals most commonly reported there was no change

in their consumption after surgery.

There is scant literature regarding lifetime prevalence of other non-prescribed substance

use in the bariatric population specifically, so it is difficult to compare the present study's results

to other samples. Virtually all extant prevalence data comes from the pre-surgical screening

process which, as mentioned above, likely has data validity concerns due to the role of screening

in the surgical approval process. Additionally, available data often lumps all substances into one

category which further limits our ability to draw conclusions. In the current study, rates of six or

more instances of substance use were very similar to prevalence of lifetime use of each substance

in the general adult population (SAMHSA, 2018, 2019). Given that lifetime use is often defined

as at least one use, the similarity between lifetime use rates in the general population and rates of

6+ uses of substances in the present sample suggests elevated substance use rates in the present

study's sample compared to levels observed at a population level. Over half, (56.7%) of

participants had at least six instances of use for one substance over their lifetime. However, only

31.4% (N=22) of these participants had clinically significant scores on the SPQ drug use

subscale, suggesting most of these participants were engaged in use casually without significant

related problems. A similar percentage of these participants self-reported lifetime history of

problems related to their substance use (26.4%, N=19).

Not surprisingly, cannabis was the most commonly used substance in our sample with

almost half (46.5%) of participants reporting use six or more times in their lives. According to

the CDC's reporting, 18% of adults have used cannabis at least once in the past year (2020) and

nearly half have used at least once in their lifetime (NSDUH, 2022). In a bariatric population,

previous research has provided a prevalence rate of lifetime cannabis abuse/dependence as

defined by the DSM-IV of 3.1% which is lower when compared to the general population (8.5%;

Stinson et al., 2006). Interpretation and comparison of such statistics is difficult due to rapidly

shifting attitudes and legislation about cannabis (Chaudhry et al., 2016). These changes reflected

in clinical recommendations and provider response for cannabis use among those seeking

bariatric surgery approval. While the current Association of Metabolic and Bariatric Surgery

(AMBS) recommendations state that "regular" cannabis use is a contraindication for bariatric

surgery due to the association of cannabis use with "high-risk behaviors" (Rummell & Heinberg,

2014), the research does not clearly support this recommendation among bariatric patients. The

belief about the association between cannabis use and other high-risk behaviors is partially

supported by the present study finding that those with a history of cannabis use have higher

scores on measures examining problematic alcohol use, attitudes, and behaviors, as measured by

CAGE and SPQ Alcohol scores. Our conclusions related to cannabis use in this population are

limited due to the lack of specificity in our data, specifically the lack of information about

quantity of frequency of use and use across different timepoints. The second most frequently

endorsed substance was misuse of prescription opioids, with 22.8% of the sample reporting 6+

instances of prescription opioid use pre- or post-surgically. Prior research has found that 36% of

bariatric surgery candidates used prescribed opioids in the year prior to surgery (Raebel et al.,

2013) which is thought to be partially related to the high occurrence of chronic pain in obese

patients (Okifuji & Hare, 2015). However, the rates of prescription opioid misuse in a post

bariatric sample are not clearly documented. Approximately 21 to 29% of individuals in the

general population who are prescribed opioid medication will at some point misuse them (NIDA,

2022) and 5.8% of a population sample reported prescription drug misuse over the past 12

months (NSDUH, 2020).

Behavioral Addictions

The behavioral addiction most commonly reported in the present study sample was

shopping, with 35% (N=44) of participants scoring above the clinical cutoff for the SPQ

shopping subscale. In the present study, the prevalence rate of shopping addiction is especially

notable in comparison to the estimated lifetime prevalence of compulsive buying, which ranges

from 1.8-5.8% (Faber & O'Guinn, 1992; Koran et al., 2006; Magee, 1994), suggesting highly

elevated compulsive shopping among bariatric surgery patients. These rates are consistent with

existing research documenting the high rates of compulsive buying among binge eaters (Faber &

O'Guinn, 1992; McElroy et al., 1994). After an extensive review of the literature, only one other

study was found that sought to establish prevalence rates of behavioral addictions in the bariatric

surgery population. Mitchell et al. (2015) found that among a sample of 201 bariatric patients,

compulsive buying was also the most common addictive behavior, however, their results found

only approximately 10% exhibiting compulsive buying pre- or post-operatively, suggesting the

prevalence of shopping addiction in bariatric patients may be even more elevated than previously

thought.

Previous research among bariatric patients found 4% had a lifetime history of clinically

significant gambling (Mitchell et al., 2015) similar to lifetime prevalence of problem gambling in

the general population of 3.5-5.1% (Volberg, 1996). The prevalence rate in the present study was consistent with both population prevalence and previously established prevalence among bariatric patients; 3.2% (N=4) score above the clinical cut-off for SPQ gambling subscale. Regarding exercise addiction, previous research on 201 bariatric patients found only two patients (>1%) had clinically significant exercise dependence pre-operatively or up to three years post-operatively (Mitchell et al., 2015). In contrast, the present study found 6.3% (N=8) had clinically significant scores on the SPQ exercise subscale, which assesses lifetime exercise addiction. Mitchell et al. (2015) used the Exercise Dependence Assessment Scale (EDAS; Klein et al., 2004) which asks about attitudes and behaviors in the past three months. The wider time frame assessed in the present study is likely the reason prevalence rate was heightened compared to previous similar research. Lifetime prevalence of exercise dependence ranges from 3-14% depending on how it is conceptualized (Trott et al., 2020), which suggests rates in bariatric patients are similar to population rates.

It is estimated that 3-5% of the U.S. population struggle with compulsive sexual behavior (Society on the Advancement of Sexual Health, 2020), which is somewhat lower than prevalence rate in our sample (7.1%). The discrepancy may suggest heightened rates of compulsive sexual behavior among bariatric patients. Further, Mitchell et al. (2015) found only 1.5% (N=3) of bariatric patients screened positive for compulsive sexual behavior, which is also lower than present study findings, suggesting compulsive sexual behavior is higher among bariatric surgery patients than previously documented. Lastly, work addiction prevalence has not been documented in the bariatric population, however, population prevalence is estimated between 5-10% (Scott et al., 1997; Sussman et al., 2011). About 7.9% of our sample scored in the clinically significant range which is similar to population prevalence. For the majority of

addictive behaviors, participants did not endorse a change in the frequency or intensity of these behaviors after surgery.

Implications for Research/Clinical Work

There are multiple implications for both clinical and research practice based on these findings. While rates of bariatric surgery continue to increase, there is still little known about the psychosocial impacts of this procedure. Use of alcohol and other substances can lead to serious complications or negative outcomes from bariatric surgery such as wound complications, infection, and vasculitis (Choi & Scarborough, 2004; Egred & Davis, 2005; Gravante et al., 2007; Haskins et al., 2014; Livingston et al., 2006; Spaniolas et al., 2018). Furthermore, despite the growing research that there can be major psychosocial changes after bariatric surgery, pre-surgical counseling is inconsistent and long-term post-surgical follow-up support is lacking. Not only can the results of this current study inform further research about temporal trends of post-surgical behaviors and symptoms but can also help inform current clinical care by improving screening and early intervention in order to decrease negative surgical outcomes or complications. Providers should be prepared to discuss the ways alcohol consumption may have different impacts post-surgically compared to pre-surgically with all bariatric surgery patients. For example, bariatric procedures and resulting weight loss may impact alcohol tolerance, sensitivity, and overall effects of alcohol. These conversations are especially important among bariatric surgery patients confirmed as higher risk for alcohol use related problems, including males, individuals with a history of major depressive disorder, marijuana use, family history of substance use disorder and/or those with history of regular cigarette smoking.

Study Limitations, Strengths, and Future Directions

Sample Characteristics

Given the limited sample size ($N = 127$), certain statistics could not be run due to lack of appropriate statistical power. With a larger sample size, more sophisticated analyses could have been performed; for example, linear regression analyses could have been used to examine whether psychosocial factors (e.g., history of major depressive episodes, trauma exposure) and surgical factors (e.g., weight loss, time passed since surgery) predicted post-surgical alcohol consumption or severity of alcohol related problems. However, given the preliminary and exploratory nature of the current study, these findings provide justification to recruit larger samples to employ these methods in the future.

The demographics of our sample were largely consistent with the demographic characteristics seen among the general population of bariatric surgery patients. Bariatric surgery patients are mostly white, non-Latinx women, which also describes the majority of our sample. While the heterogeneity of our sample is characteristic of bariatric patients, greater diversity in both race and gender would have allowed for comparisons of substance use variables by racial, ethnic, and gender groups. We had sufficient power for some limited gender difference analyses, but a more diverse sample would have provided valuable opportunities to fill a gap in understanding regarding the intersection of both racially minoritized individuals with a history of bariatric surgery and potential gender differences in post-surgical experiences.

Measures

One limitation of the study design is the use of the retrospective, self-report measures exclusively. Individuals were asked questions related to their consumption tobacco, caffeine, and other substances to describe their patterns of use for a specific period. For example, individuals were asked to recall their 30-day period of heaviest caffeine consumption and reported the number of times they drank coffee and caffeinated energy drinks during this month. For alcohol quantity and frequency measures, individuals were asked to recall heaviest pre-surgical drinking which, for some individuals, may have been over 10 years ago. While previous research has found a Time Line Follow Back (TLFB) method is the most accurate retrospective method for collecting alcohol quantity frequency data, there were concerns about its use that prevented it from being employed in this study. The concerns included that (1) participants would be unable to remember pre-surgical information with that level of specificity and (2) the TLFB would be too cumbersome for participants and cause a high level of participant fatigue, potentially impinging on the quality of the data. Due to the concern for accuracy, the alcohol questions used were carefully chosen to maximize accuracy of self-report data. Questions for alcohol and tobacco use history were used from the National Longitudinal Survey of Youth (NLSY; Bureau of Labor Statistics, 2012) as previous research has established these questions as highly accurate relative to more detailed and lengthy questionnaires (Dawson, 2003; Stevens et al., 2020). Despite these considerations, the validity of self-reported substance use data has been widely questioned and studied in the literature for decades and should be considered as we interpret the data from the present study.

Additionally, due to the length of the survey overall, several measures were chosen for their simplicity and brevity to reduce burden on participants and to minimize respondent burnout.

While measures were carefully considered based on validity and specificity, it is possible these

simpler variables prevented us from making more sophisticated conclusions about participant

behaviors. For example, the BTQ was used to measure participant lifetime traumatic event

exposure. While this measure gives us a binary response to potentially traumatic events

experienced by individuals, it does not ask questions about post-traumatic stress symptoms or

include when the traumatic event took place. Without this information, we are unable to

determine if the participant experienced psychological distress related to the event or when in

relation to their bariatric surgery the event took place – both of which may significantly change

how at risk they are of alcohol related problems post-surgically.

While lifetime substance use consumption history was collected from all participants, our

ability to draw meaningful conclusions from this data is limited. We did not collect information

on problems related to the consumption of specific substances. Questions were phrased to

include all substances under one umbrella due to concerns about survey length. While

information regarding the prevalence and correlates of general substance use in a bariatric

sample still fills a gap in our current knowledge, more nuanced conclusions about specific

substances of use are not able to be made with the results of our present study. One area of

research that would benefit from future investigation is use of cannabis among bariatric surgery

patients. While limited, there is some documentation of using cannabis to manage post-operative

pain and nausea (Baron, 2015; Merriman & Oliak, 2008). Despite the possibility of its

therapeutic value, concerns about its impact on weight and appetite lead physicians to consider

cannabis use a contraindication for bariatric surgery (Barry et al., 2009; Berridge et al., 2010). As

clinical and legal perceptions of cannabis change, occasional nonproblematic casual use may be

more common, making it exceedingly important to understand the differing impacts of casual

and problematic cannabis use.

Addictive Behaviors. Screening questions were added for each addictive behavior

measured by the SPQ to minimize respondent fatigue. While these questions were adapted from

commonly used and well validated screening instruments, it is possible that these items were

overly restrictive and prevented us from obtaining data from individuals with sub-clinical levels

of these problems. For both gambling and exercise, SPQ found 100% of individuals who endorse

lifetime problematic or excessive engagement in these behaviors had SPQ subscale scores above

clinical cutoffs. This may signal that shorter assessments or brief screening may be a more

efficient way to identify clinically significant attitudes/behaviors without requiring an individual

to respond to 10+ items. However, it may also be a reflection of screener questions

unintentionally excluding those with subclinical levels of these behaviors. Further research

should instead rely on previously validated screening measures to determine which participants

are eligible for further questions in order to prevent unintentional bias or participant exclusion.

Surgical Changes

A major strength of this study is its inclusion of bariatric surgery patients far removed

from their procedure. Among participants, time since surgery ranged from 1 to 41 years, giving

us a more comprehensive picture of post-surgical experience than previous research. However,

the decision to include those several decades from bariatric surgery may make it more difficult to

connect post-surgical behaviors to the surgery itself; longer periods between surgery and survey

completion allow for more possible confounds. Limiting research to fewer types of bariatric

surgery may also remove confounds in the data and reveal more meaningful patterns. Early

research suggests differential risk of alcohol use problems among patients depending on the type of bariatric surgery received. Specifically, those with received bypass procedures (RYGB) were at higher risk for post-operative AUD (Conason et al., 2013; King, Chen, Belle, et al., 2017; King et al., 2012). More targeted research on these high-risk patients may be more beneficial to understand post-surgical changes. Future analysis using these results should focus on the relationship between time elapsed since surgery and substance use variables, particularly alcohol consumption. Previous research suggests that substance use, particularly alcohol consumption, initially decreased post-surgically but gradually increases above preoperative levels or population norms (King et al., 2012). The present study was only able to examine alcohol use and related problems for relationships with time since surgery, due to small Ns and lack of specificity in data on other substances and addictive behaviors. Preliminary analysis on these variables was conducted, but no significant relationships were found between alcohol use and time since surgery. Despite this, the relationship warrants further investigation; a relationship may be illuminated with a larger sample, and exclusion of participants with an excessively long time after surgery may allow us to draw more meaningful conclusions.

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APPENDIX A

Research Match Study Brief Description:

This study focuses on the experiences of individuals who have previously had bariatric or weight

loss surgery at least one year ago. This study involves answering a variety of survey questions on

substance use, other risky, problematic, or potentially addictive behaviors, mental health, and

demographic information. The research will take about 15 minutes to complete, and you will

have a chance to win a gift card as a thank you for your participation. Research is being

conducted by Virginia Commonwealth University's (VCU) Psychology Department under Dace

Svikis, PhD.

Participant Initial Email Contact:

Hello,

Thank you for your interest in our study. This study is examining the presence of addictive

and/or problematic behaviors among individuals who have received bariatric surgery.

Participants will be asked to answer questions regarding their use of alcohol and other drugs throughout their lifetime as well as their engagement in several risky, problematic, or potentially addictive behaviors. Questions may also ask about current or past mental health concerns.

This study is entirely anonymous. Participant will take approximately 20 minutes. If you participate, you will have a chance to win a $10 Amazon e-gift card.

This research is being conducted by the Psychology department at Virginia Commonwealth University (VCU). The research team is led by Dace Svikis, PhD.

More detailed information about study procedures and how to participate can be found at the following link:

(link to Study Info Sheet/consent in RedCap, with access to complete screener questions if desired)

Please note, clicking this link does not require you to participate in the study. You will be given an opportunity to learn about the study in further detail before choosing to consent to participation.

Thank you! Please contact study staff at abbastudy@vcu.edu with questions or concerns.

Electronic Study Poster:

Addictive Behaviors in Bariatric Adults (ABBA) Study

What is it?

- This is a study investigating potentially addictive or problematic behaviors among individuals who have had weight loss surgery at least 1 year ago

What is involved?

- This study involves answering a variety of survey questions on substance use, other risky, problematic, or potentially addictive behaviors, mental health, and demographic information
- Completing the survey will take approximately 15 minutes
- You will be eligible to win a gift card through a raffle for participating

How can I participate?

- If you are interested in participating, please email the study team at abbastudy@vcu.edu

What else should I know?

- If you have any questions or concerns, please contact the study team at abbastudy@vcu.edu
- Research is being conducted by Virginia Commonwealth University's (VCU) Psychology Department under Dace Svikis, PhD

Study Information & Consent Sheet:

This research aims to increase our understanding of the needs and experiences of people with a history of bariatric surgery. This study will ask you questions about your mental health, your eating behaviors, bariatric surgery related medical history, use of alcohol and other substances, and your history of other possibly addictive behaviors such as gambling, exercise, or sex. This study is being conducted by members of Virginia Commonwealth University's (VCU) psychology department, in part as fulfillment of requirements for master's thesis.

This survey will take approximately 15 minutes to complete.

Participation in this study is completely voluntary. Please take as long as you need to decide if you are willing and able to participate in this study. You can exit the study at any time without repercussions, even after consent is given.

This study is anonymous. Identifying information (e.g. name, date of birth, address etc) not be collected in order to protect your privacy. Data from these questionnaires may be published in the future, but any identifying information will be removed, and only aggregate data will be presented. After identifiers are removed, information could be used for future research studies without additional informed consent from you.

If you choose to, after completion of study questionnaires, you may be asked to provide an email address to opt into raffle drawing for an Amazon e-gift-card as compensation for your time. All email addresses will be collected in a separate form and will in no way be linked to study responses.

At the completion of data collection, four winners will be randomly chosen to receive a $10 Amazon e-gift card. Chances of winning will vary depending on total number of survey participants who opt into the raffle but will not be lower than 2%.

If you have any questions or concerns about this study or any of its components, you can contact study staff at abbastudy@vcu.edu.

APPENDIX B

Demographics and Surgical Information

How would you describe your gender identity?

- Female
- Male
- Non-binary/third gender
- Prefer not to say

What is your age? _____

How would you describe your sexual orientation?

- Straight/Heterosexual
- Gay or Lesbian
- Bisexual
- Queer
- Asexual
- Prefer not to say

How would you describe your race?

- American Indian or Alaskan Native
- Asian
- Black or African American
- Native American or Other Pacific Islander
- White
- Some other race, ethnicity or origin
- Prefer not to say

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

- No, not of Hispanic, Latino/a/x, or Spanish origin
- Yes, Mexican, Mexican American, Chicano/a/x
- Yes, Puerto Rican
- Yes, Cuban
- Yes, another Hispanic, Latino/a/x or Spanish origin
- Prefer not to say

What form of bariatric surgery did you receive?

- Roux-en-Y Gastric Bypass (RYGB)
- Gastric Balloon Placement
- Gastric Band or Lap Band surgery
- Some other kind of bariatric or weight loss surgery
    - Please describe the procedure here: _____

What year did you receive your bariatric or weight loss surgery? _____

Did you have any major medical complications related to your bariatric or weight loss surgery?

- Yes
    - If yes, please describe here:
- No

What was your pre surgery weight? _____

What was your lowest post-surgical weight? _____

How long after your procedure did you reach this weight? _____

What is your current weight? _____

Please enter your height: _____

This next section will ask you about a variety of addictive behaviors. Please pay attention to the period specified for each question. Several questions will refer to "your surgery" (pre-surgery, post-surgery etc.) – please take this as a reference to your weight loss or bariatric surgery.

ALCOHOL

First, we are going to ask you about your alcohol consumption…

In your entire life, have you had at least one drink of any kind of alcohol, not counting small tastes or sips? Count one drink as a can or bottle of beer; a wine cooler or a glass of wine, champagne, or sherry; a shot of liquor or a mixed drink or cocktail.

     o   Yes

     o   No

IF NO:

So, you have never had even one full alcoholic drink?

       o   No, I have had at least one full alcoholic drink

       o   Yes, I have never had even one full alcoholic drink

IF "Yes, I have never had even one full alcoholic drink" SKIP to tobacco section

Have you ever consumed alcohol regularly?

       o   Yes

       o   No

How many times in your life have you had 6 or more drinks in one day?

       o   Never

       o   Once or twice

       o   3-5 times

       o   6-10 times

       o   11+ times

PROMIS QUESTIONNAIRE – Alcohol Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have found that feeling light-headed has often been irrelevant in deciding when to stop drinking alcohol.

2. I have found that having one drink tended not to satisfy me but made me want more.

3. I have had a complete blank of ten minutes or more in my memory when trying to recall what I was doing after drinking alcohol on the previous day or night.

4. I have used alcohol as both a comfort and a strength.

5. I have tended to gulp down the first (alcoholic) drink fairly fast.

6. I had a good head for alcohol so that others appeared to get drunk more readily than I did.

7. I have found it strange to leave half a glass of (alcoholic) drink.

8. I have been irritable and impatient if there has been more than ten minutes of conversation at a meal or social function before my host offers me an alcoholic drink.

9. I have deliberately had an alcoholic drink before going out to a place where alcohol may not be available.

10. I have often drunk significantly more alcohol than I intended to.

Think about your life before you had your bariatric/weight loss surgery… During that time, think about the 30 day period where your drinking was at its heaviest…

During this time, approximately how many days did you drink any alcoholic beverages, including beer, wine, or liquor?

Enter number of days: _____

On the days you did drink, about how many drinks would you have on an average day? By a drink we mean the equivalent of a can of beer, a glass of wine, or a shot glass of hard liquor.

Enter number of drinks: _____

How often would you have 4 or more drinks (if female) or 5 or more (if male)?

Enter number of days: _____

Now, please think about your life after your bariatric/weight loss surgery. During this time, think about the 30 day period where your drinking was at its heaviest…

During this time period, on about how many days did you drink any alcoholic beverages, including beer, wine or liquor?

Enter number of days: _____

On the days you did drink, about how many drinks did you have on an average day? By a drink we mean the equivalent of a can of beer, a glass of wine, or a shot glass of hard liquor.

Enter number of drinks: _____

Within these 30 days, how often have you had 4 or more drinks (if female) or 5 or more drinks (if male)?

Enter number of days: _____

Think about your answers to the last few questions…. Would you say this is about the same as your current drinking habits?

o   Yes
o   No

IF NO –

In the last 30 days, on about how many days did you drink any alcoholic beverages, including beer, wine or liquor?

Enter number of days: _____

On the days you did drink, about how many drinks would you have on an average day? By a drink, we mean the equivalent of a can of beer, a glass of wine, or a shot glass of hard liquor.
Enter number of drinks: _____

How many times have you have 4 or more drinks (if female) or 5 or more drinks (if male) in one sitting?

Enter number of days: _____

Overall, do you feel your consumption of alcohol changed pre- to post- surgery?

- o Yes, my alcohol consumption increased after surgery
- o Yes, my alcohol consumption decreased after surgery
- o No, my alcohol consumption did not change after surgery

Do you feel you ever had a problem related to your alcohol consumption? (e.g., legal consequences related to drug use, inability to fulfill personal or occupational responsibilities due to drug use, concern from loved ones about drug use)

- o Yes, but only before surgery
- o Yes, but only after surgery
- o Yes, both before and after surgery
- o No, never

CAGE Questionnaire

1. Have you ever felt you should cut down on your drinking?
2. Have people annoyed you by criticizing your drinking?
3. Have you ever felt bad or guilty about your drinking?
4. Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (eye-opener)?

TOBACCO

Now we are going to ask you about your use of nicotine/tobacco products, focusing first on cigarette use…

How many cigarettes have you smoked in your lifetime?

- o More than 100 cigarettes
- o Less than 100 cigarettes
- o None, I never tried a cigarette

Have you ever smoked daily?

- o Yes

- o No

How many cigarettes were you smoking per day when your smoking was at its heaviest?

_____ cigarettes per day

How about these other tobacco products? (vapes, smokeless tobacco, pipes, cigarillos, etc.) Have you ever used these regularly?

- o Yes

    IF YES

    Please describe what tobacco product you use most frequently: _____

- o No

If less than 100 and no regular use of other tobacco products - omit remainder of tobacco section, continue to recreational drug questions

PROMIS QUESTIONNAIRE – Tobacco Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have preferred to use nicotine throughout the day rather than only at specific times.
2. I have tended to use nicotine as both a comfort and strength even when I feel that I did not want any.
3. I have been afraid that I will put on excessive amounts of weight or become particularly irritable or depressed if I give up using nicotine altogether.
4. I have often found that having my first use of nicotine in any day tends not to satisfy me but made me want more.
5. I have continued to use nicotine even when I have had a bad cold or even more serious respiratory problem.

6. I have found that my nicotine consumption goes up or down when I am off alcohol or drugs or when I am on a diet.

7. I have deliberately used nicotine before going out to a place where I may not be able to use it.

8. When I ran out of my favorite form of nicotine, I have accepted the offer of an alternative that I do not particularly like.

9. I have often used nicotine to calm my nerves.

10. I have often used nicotine significantly more than I intended to.

Did you consumption of tobacco change pre- to post- surgery?

- o Yes, it increased after surgery
- o Yes, it decreased after surgery
- o No change

Did you ever used cigarettes or other tobacco products as an appetite suppressant or weight management tool?

- o Yes, but only before surgery
- o Yes, but only after surgery
- o Yes, before and after surgery
- o No, never

Do you feel you ever had problems related to your tobacco consumption? (Problems could be things like, arguing with family members/loved ones about your tobacco use, continuing to smoke despite health consequences)

- o Yes, but only before surgery
- o Yes, but only after surgery
- o Yes, both before and after surgery
- o No, never

The next section will ask about your use, behaviors, and attitudes surrounding substances…

Which of the following substances have you used at least 6 times in the following time frames?

	Any time Before Surgery	Any time After Surgery
Marijuana (weed, blunts)		
Heroin		
Prescription Opioids (Oxycodone, pain killers,		
Stimulants (Cocaine, methamphetamine)		
Sedatives (Benzodiazepines, GHB)		
Synthetics (K2/Spice, bath salts, ketamine GHB)		
Hallucinogens (MDMA, Ecstasy/Molly, LSD, PCP, Peyote, psilocybin)		

IF NO SUBSTANCE > 6 INSTANCES OF USE (PRE OR POST SURGERY),
OMIT REMAINDER OF SECTION, PROCEED TO CAFFEINE SECTION

PROMIS Questionnaire – Drug Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have particularly enjoyed getting a really strong effect from drugs.
2. I have had a sense of increased tension and excitement when I knew that I had the opportunity to get some drugs.

3. Other people have expressed repeated serious concern about some aspects of my drug use.

4. I have found that getting high tends to result in my going on to take more drugs.

5. I have tended to use drugs as both a comfort and strength.

6. I have often found that I use all of the drugs in my possession even though I had intended to spread them out over several occasions.

7. I have tended to make sure that I have the drugs or the money for drugs before concentrating on other things.

8. I have been irritable or impatient if my supply of drugs is delayed for 10 minutes or so for no good reason.

9. I have tended to use more drugs if I have more.

10. I have deliberately used drugs before going out for a time if I have felt there might not be the opportunity to use them later.

11. I have often found myself taking more drugs than I intended to.

12. If I had run out of my usual or preferred substance, I would take an alternative even if I was not sure about its effects

Have you ever misused a mood altering prescription medication (benzodiazepine, narcotic, analgesic etc)? Examples of prescription misuse include taking a medication in a manner or dose other than prescribed, taking someone else's prescription, or taking a medication to feel euphoria.

- o   Yes, but only before surgery
- o   Yes, but only after surgery
- o   Yes, both before and after surgery
- o   No, never

Overall, do you feel your substance use changed after your bariatric/weight loss surgery?

- o   Yes, it increased after my surgery
- o   Yes, it decreased after my surgery
- o   No, it did not change

Do you feel you ever had problems related to your drug use? (e.g., legal consequences related to drug use, inability to fulfill personal or occupational responsibilities due to drug use, concern from loved ones about drug use)

- o   Yes, but only before surgery
- o   Yes, but only after Surgery
- o   Yes, both before and after surgery
- o   No, never

Next, we're going to talk about your consumption of caffeine…

At your heaviest how often did you drink caffeinated coffee?

- o   Every day
- o   5-6 days a week
- o   3-4 days a week
- o   1-2 days a week
- o   Not at all

At your heaviest how often did you drink caffeinated energy drinks? (ex. Monster, Red Bull, 5 Hour Energy Shots)

- o   Every day
- o   5-6 days a week
- o   3-4 days a week
- o   1-2 days a week
- o   Not at all

IF YES – ADMINISTER PROMIS CAFFEINE SUBSCALE

IF NO – SKIP TO FOOD BINGEING QUESTIONS

PROMIS Subscale – Caffeine Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely

applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have had an intimate relationship with caffeine so that in a strange way I have felt that I became a real person only when I used it.

2. I have preferred to take caffeine on my own rather than in company.

3. I have felt it would be more painful for me to give up caffeine than to give up a close friendship.

4. I have regularly stolen or helped myself to other people's caffeine even though I had enough money to buy my own.

5. I have tended to time my intake of caffeine so that others are not really aware of my total intake.

6. I have had a sense of increased tension and excitement when I buy caffeine substances or when I see advertisements for them.

7. I have found that my intake of another form of caffeine tends to increase when I am off my own favorite.

8. When I have used too much caffeine, I have tended to feel defiant as well as disappointed in myself.

9. I have sometimes rushed through a meal, or skipped it altogether, so that I can have some caffeine.

10. I have often been capable of drinking 20 cups of tea or coffee or caffeinated soda

Did your consumption of caffeine change pre- to post- surgery?

- o   Increased
- o   Decreased
- o   No Change

Do you feel you ever had a problem related to your caffeine consumption? (Headaches when trying to cut back, drinking caffeine despite negative health consequences etc)

- o   Yes, but only before surgery
- o   Yes, but only after Surgery

  o Both before and after surgery

  o No, never

FOOD BINGEING & FOOD STARVING

The next section will ask about your experiences with food.

  Have you ever eaten large quantities of food very quickly, even when not hungry, to the point of being full? Or have you ever felt your eating behavior was out of control?

    o Yes

    o No

    IF NO: Food bingeing subscale will be omitted, continue to food starving questions

  Did this behavior occur before or after surgery?

    o Yes, but only before surgery

    o Yes, but only after surgery

    o Yes, both before and after surgery

    o No,

  Did this behavior change in frequency pre- to post- surgery?

    o It occurred more frequently after surgery

    o It occurred less frequency after surgery

    o There was no change in frequency after surgery

PROMIS SUBSCALE – Food Bingeing Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have tended to think of food not so much as a satisfier of hunger but as a reward for all the stress I endure.
2. I have tended to use food as both a comfort and a strength even when I have not been hungry.
3. I have found that being full has often been irrelevant in deciding when to stop eating.
4. I have found that I have sometimes put on weight even when I am trying to diet.
5. Other people have expressed repeated serious concern about my excessive eating.
6. I have often preferred to eat alone rather than in company.
7. When I have definitely eaten too much, I have tended to feel defiant as well as disappointed in myself.
8. I have preferred to graze like a cow throughout the day rather than ever allow myself to get hungry.
9. I have had three or more different sizes of clothes in my adult (nonpregnant, if female) wardrobe.
10. I have been aware that once I have consumed certain foods I have found it difficult to control further eating.

Have you ever felt strongly compelled to restrict your food intake despite negative consequences?

- o Yes
- o No

IF YES: Include following questions and Food starving subscale

IF NO: Food starving subscale will be omitted, continue to shopping section

Did this behavior occur before or after surgery?

- o Yes, but only before surgery
- o Yes, but only after surgery
- o Yes, both before and after surgery

Did this behavior change in frequency pre- to post- surgery?

- o It occurred more frequently after surgery

- o It occurred less frequency after surgery

- o There was no change in frequency after surgery

PROMIS QUESTIONNAIRE – Food Starving subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. In a restaurant or even at home I have often tried to persuade others to choose dishes that I knew I would like even though I would probably refuse to eat them.

2. When I have eaten in company I have liked to be with special friends or family members whom I can rely on to finish off some foods for me.

3. I have had a list of so many things that I dare not eat, so that there is very little left that I can eat.

4. I have often chewed something and then taken it out of my mouth and thrown it away.

5. I have particularly enjoyed eating raw vegetables and also salty or sour things.

6. When I have eaten in company, I have tended to time my eating as a form of strategy so that others are not really aware of just how little I am eating.

7. When I have eaten something reasonably substantial, I have tended to feel disappointed or even angry with myself as well as slightly relieved.

8. I have become irritable and impatient at mealtimes if someone has tried to persuade me to eat something.

9. I have often avoided mealtimes by claiming that I have already eaten when it is not true.

10. Some food has made me wish I could eat it like other people do but I nonetheless find that I could not bring myself to do so.

Shopping

Have you ever felt you were out of control of your shopping habits? Or your shopping behaviors became problematic? Some people would call this being a "shopaholic" or being "addicted" to shopping. Sometimes this kind of problematic shopping can look like, spending more money than one can afford, using shopping to cope with difficult emotions like anger or depression, or issues in relationships due to shopping. Do you feel like this has ever applied to you?

- o Yes
- o No

IF NO: Shopping subscale will be omitted, continue to gambling section

PROMIS QUESTIONNAIRE – Shopping Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have felt uncomfortable when shopping with other people because it has restricted my freedom.
2. I have particularly enjoyed buying bargains so that I often finished up with more than I need.
3. I tend to use shopping as both a comfort and a strength even when I do not need anything.
4. I have tended to go shopping just in case I might see something I want.
5. When I have been shopping with family members, friends, or other people, I have tended to disguise the full extent of my purchases.
6. I have often bought so many goods (groceries, sweets, household goods, books, etc.) that it would take a month to get through them.
7. I have preferred to keep my shopping supplies topped up in case of war or natural disaster, rather than let my stocks run low.
8. I have bought things not so much as a means of providing necessities but more as a reward that I deserve for the stresses that I endure.
9. I have felt that I become a real person only when I am shopping or spending.

10. I have often gone shopping to calm my nerves.

Do you feel you ever had a problem (e.g., shopping to point of financial difficulties, loved ones expressing concern about shopping frequency/amount, feeling out of control when you shop) related to your shopping habits?

- o Yes, but only before surgery
- o Yes, but only after surgery
- o Both before and after surgery
- o No, neither

Do you think the frequency of your uncontrollable shopping, or the intensity of your shopping problem changed after your weight loss surgery?

- o Yes, it increased after surgery
- o Yes, it decreased after surgery
- o No Change

Gambling

Have you ever been told you have a gambling problem or had difficulty controlling your gambling habits on your own? Gambling may refer to lotteries, games such as Lotto or Keno, sports betting, poker and other card games, bingo, slots, or other games of chance. Problem gambling can sometimes look like needing to gamble with increasing amounts of money in order to feel excitement, lying to loved ones about the frequency of your gambling or the amount of money lost, or feeling restless or irritable when you were trying to cut down or control your gambling. Do you feel this has ever applied to you?

- o Yes
- o No

IF NO: Gambling subscale will be omitted, continue to sexual behavior section

PROMIS QUESTIONNAIRE – Gambling Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have found that the amount that I have won or lost has often been irrelevant in deciding when to stop gambling or risk taking.

2. I have stolen or embezzled to cover gambling losses or to cover my losses in risky ventures.

3. I have found it more painful for me to give up gambling and risk taking than to give up a close friendship.

4. Other people have expressed repeated serious concern over my gambling or risk taking.

5. I have tended to accept opportunities for further gambling or risk taking despite having just completed a session or a project.

6. I have preferred to gamble or to take risks in one way or another throughout the day rather than at particular times.

7. I have tended to use gambling or risk-taking as a form of comfort and strength even when I have not felt that I particularly want to gamble or take further risks.

8. I have gambled or taken risks at the first opportunity in case I did not get the chance later on.

9. When my favorite form of gambling or risk taking is unavailable, I have gambled on something else I normally disliked.

10. I have been irritable and impatient if there is a complete break of 10 minutes in a gambling session.

Did the frequency of your gambling change pre- to post- surgery?

  o Yes, my gambling increased after surgery
  o Yes, my gambling decreased after surgery
  o No, my gambling did not change after surgery

Have you ever had problems related to your gambling habits? (e.g., financial problems related to gambling, concern expressed by loved ones due to gambling, gambling negatively impacting other responsibilities)

- o   Yes, but only before surgery
- o   Yes, but only after Surgery
- o   Yes, both before and after surgery
- o   No, never

SEXUAL BEHAVIOR

Have you ever had difficulties controlling your sexual desires or behaviors? Some people would refer to this kind of person as a "sex addict." Problematic or uncontrollable sexual behavior can sometimes look like neglecting other important parts of your life in order to engage in sex, engaging in risky or unsafe sex even though you knew it could potentially cause you harm, or unsuccessfully trying to cut back on time or money spent on sexual activities. Do you feel this has ever applied to you?

- o   Yes
- o   No

IF NO: Sex subscale will be omitted, continue to work section

PROMIS QUESTIONNAIRE – Sexual Behavior Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have found it difficult to pass over opportunities for casual or illicit sex.
2. Other people have expressed repeated serious concern over my sexual behavior.
3. I have prided myself on the speed with which I can get to have sex with someone and I have found that sex with a complete stranger is stimulating.
4. I have taken opportunities to have sex despite having just had it with somebody else.

5. I have found that making a sexual conquest has caused me to lose interest in that partner and led me to begin looking for another.

6. I have tended to ensure that I have sex of one kind or another rather than wait for my regular partner to be available again after an illness or absence.

7. I have had repeated affairs even though I had a regular relationship.

8. I have had three or more regular sexual partners at the same time.

9. I have had voluntary sex with someone that I dislike.

10. I have tended to change partners if sex becomes repetitive.

Do you feel you ever had a problem related to your sexual activities? (e.g., putting self in unsafe situations to engage in sexual behavior, continuing with sexual behavior despite negative legal, personal or occupational consequences, feeling unable to control your sexual urges)

- o Yes, but only before surgery
- o Yes, but only after Surgery
- o Yes, both before and after surgery
- o No, never

Did these problems change in intensity or frequency after surgery?

- o Yes, increased
- o Yes, decreased,
- o No, they did not change

WORK

Have you ever had difficulty disconnecting from your work life or worked more than was financially necessary, to the point where you no longer felt in control? Some people would call a person like this a "workaholic." Uncontrollable or problematic work habits can sometimes looks like putting more time and energy into work than you do to relationships with loved ones, difficulty relaxing when you are not able to work, or holding extremely high, impossible standards for yourself in work related measures. Do you think this has ever applied to you?

○ Yes

○ No

IF NO: Work subscale will be omitted, continue to exercise section

PROMIS QUESTIONNAIRE – Work Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have taken on a piece of work that I actively disliked not so much out of necessity but more simply to keep myself occupied.

2. I have tended to work faster and for longer hours than any other people of my own ability so that they have found it difficult to keep up with me.

3. When I have definitely overworked and got myself irritable and overtired, I have tended to feel defiant as well as slightly ashamed.

4. I have tended to tidy up the mess that someone else has got into at work, even when I have not been asked to do so.

5. I have found that finishing a specific project is often irrelevant in deciding when to stop working.

6. When working with others I have tended to disguise the full amount of time and effort that I put into my work.

7. I have tended to keep reserve projects up my sleeve just in case I find some time, even a few minutes to spare.

8. I have regularly covered other people's work and responsibilities even when there was no need for me to do so.

9. Other people have expressed repeated serious concern over the amount of time I spend working.

10. I have found that once I start work in any day I find it difficult to get "out of the swing of it" and relax.

Do you feel you ever had problems due to uncontrollable work habits? (e.g., amount worked causing strife with loved ones, neglecting other responsibilities due to work habits, being unable to disconnect from work)

- o Yes, but only before surgery
- o Yes, but only after Surgery
- o Yes, both before and after surgery
- o No, never

Did these problems change in intensity or frequency after surgery?

- o Yes, increased
- o Yes, decreased,
- o No, they did not change

EXERCISE

Have you ever had difficulty controlling the amount you exercise or struggled when you were unable to exercise? Some people might refer to people with these behaviors as an "exercise addict." Problematic or uncontrollable exercise can look like concern from loved ones about amount of exercise, exercising despite injury or illness, or neglecting other important aspects of life in order to exercise. Do you feel this has ever applied to you?

- o Yes
- o No

IF NO: Exercise subscale will be omitted

PROMIS QUESTIONNAIRE – Exercise Subscale

Please read each question carefully before answering. Please use the slider to indicate how much you agree with the following statements. For example, if you think the statement definitely applies to you, you will drag the slider all the way to the right towards "Like me." If you feel the statement definitely does not apply to you, you will drag the slider to the left towards "Not like me."

1. I have often been so tired with exercise that I have found it difficult to walk or to climb up stairs.
2. I have preferred to exercise alone rather than in company.
3. I have often tried to take exercise several times a day.
4. I have particularly enjoyed getting heavily wet with sweat when I exercise.
5. I have often felt a sense of tension and excitement when about to take exercise.
6. I have responded positively to an unexpected invitation to exercise despite having just finished my regular exercise.
7. I have felt that I become a real person only when I am exercising.
8. I have tended to use exercise as both a comfort and strength even when I have been perfectly fit and do not need any more.
9. I have often taken exercise just to tire myself sufficiently for sleep.
10. When I have gone out, I have often taken sports clothes and equipment with me "just in case" the opportunity to exercise arises.

Do you feel you ever had a problem related to your exercise habits? (e.g., putting self in unsafe situations to engage in sexual behavior, continuing with sexual behavior despite negative legal, personal or occupational consequences, feeling unable to control your sexual urges)

- o Yes, but only before surgery
- o Yes, but only after surgery
- o Yes, both before and after
- o No, never

Did these problems change in intensity or frequency after surgery?

- o Yes, increased
- o Yes, decreased,
- o No, they did not change

Lifetime Major Depressive Episode (MDE) Screening

1. Have you ever had periods of time that lasted several days or longer when you felt sad, empty, or depressed most of the day?

   No (Skip to item 3)

   Yes

2. During the episodes of being sad, empty, or depressed, did you ever lose interest or pleasure in most things like work, hobbies, or other things that you usually enjoy?

   No (Skip to item 4)

   Yes (Skip to item 4)

3. Have you ever had periods of time that lasted several days or longer when you lost interest or pleasure in most things like work, hobbies, or other things you usually enjoy?

   No (End of assessment)

   Yes

4. You mentioned having periods of time that lasted several days or longer when you [were sad and (or) lost interest or pleasure in most things]. Did you ever have a period of this sort that lasted most of the day nearly every day for two weeks or longer?

   No

   Yes

FAMILY HISTORY OF SUBSTANCE RELATED PROBLEMS

Now I would like to ask you some questions about whether any of your relatives, regardless of whether or not they are now living, have EVER had a drinking problem or problems with drugs. By drinking problem, we mean that their drinking caused problems at home, at work, with their health, or with the police, or that they received alcohol treatment.

By problems with drugs, we mean that their drug use caused problems at home, at work, with their health, or with the police, or that they received alcohol treatment.

1. Do you think your biological father has ever had a drinking problem?

    [ ] Yes

    [ ] No

    [ ] Don't Know/Refused

2. Do you think your biological father has ever had problems with other drugs?

    [ ] Yes

    [ ] No

    [ ] Don't know/Refused

3. Do you think your biological mother has ever had a drinking problem?

    [ ] Yes

    [ ] No

    [ ] Don't Know/Refused

4. Do you think your biological mother has ever had problems with other drugs?

    [ ] Yes

    [ ] No

    [ ] Don't Know/Refused

5. Do you think any of your biological siblings (same biological mother and father) have ever had a drinking problem?

    [ ] Yes

    [ ] No

    [ ] I don't know

    [ ] I have no biological siblings

6. Do you think any of your biological siblings have problems with other drugs?

    [ ] Yes

[ ] No

[ ] I don't know

[ ] I have no biological siblings

7. Do you think any of your biological grandparents (counting only the biological parents of your biological mother or father) have ever had a drinking problem?

[ ] Yes

[ ] No

[ ] I don't know

8. Do you think any of your biological grandparents have had problems with other drugs?

[ ] Yes

[ ] No

[ ] I don't know

9. Do you think any of your biological aunts or uncles (counting only those with same biological parents as your biological parent) have ever had a drinking problem?

[ ] Yes

[ ] No

[ ] I don't know

[ ] I do not have any biological aunts or uncles

10. Do you think any of your biological aunts or uncles have ever had problems with other drugs?

[ ] Yes

[ ] No

[ ] I don't know

[ ] I do not have any biological aunts or uncles