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## Examining Weight and Eating Behavior by Sexual Orientation in a Sample of Male Veterans

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### Abstract

**Objective**—Eating disorders are understudied in men and in sexual minority populations; however, extant evidence suggests that gay men have higher rates of disordered eating than heterosexual men. The present study examined the associations between sexual orientation, body mass index (BMI), disordered eating behaviors, and food addiction in a sample of male veterans.

**Method**—Participants included 642 male veterans from the Knowledge Networks-GfK Research Panel. They were randomly selected from a larger study based on previously reported trauma exposure; 96% identified as heterosexual. Measures included the Eating Disorder Diagnostic Scale, the Yale Food Addiction Scale, and self-reported height and weight.

**Results**—Heterosexual and sexual minority men did not differ significantly in terms of BMI. However, gay and bisexual men ( $n = 24$ ) endorsed significantly greater eating disorder symptoms and food addiction compared to heterosexual men.

**Conclusions**—Our findings that sexual minority male veterans may be more likely to experience eating disorder and food addiction symptoms compared to heterosexual male veterans highlight the importance of prevention, assessment, and treatment efforts targeted to this population.

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## Keywords

Eating behavior; Disordered eating; Food addiction; Veterans; Sexual orientation

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## 1. Introduction

Although disordered eating has traditionally been thought to primarily affect heterosexual Caucasian adolescent girls and young adult women,<sup>1,2</sup> recent research demonstrates a higher prevalence of eating disorders among men<sup>3</sup> and other groups traditionally considered at low risk, including ethnic/racial minorities,<sup>1</sup> older adults,<sup>4</sup> veterans,<sup>5</sup> and sexual minority individuals,<sup>6</sup> than previously recognized. Despite epidemiological evidence that these groups are affected by eating disorders, clinician bias and under-representation in the research literature contribute to under-detection of disordered eating behaviors and diagnoses among demographically diverse individuals.<sup>7</sup> Underserved groups are less likely to access care for eating disorders,<sup>8</sup> and therefore data regarding the efficacy of treatment for these populations are lacking.

The present study focused on associations between sexual orientation and eating disorder symptoms and food addiction in a sample of male veterans. Extant evidence suggests that both veterans and sexual minority individuals are at increased risk for a variety of mental health conditions, including depression, posttraumatic stress disorder (PTSD), substance use disorders (SUDs), and eating disorders.<sup>9–13</sup> However, compared to other mental health conditions, eating disorders have been relatively understudied in these populations. The literature suggests that veterans may be at increased risk for disordered eating for several reasons. Previous studies have suggested that military veteran exposure to high levels of trauma, including military sexual trauma<sup>14</sup> and combat exposure,<sup>15</sup> may increase their risk of disordered eating. Elevated rates of overweight and obesity among veterans also may increase their risk, as a higher body mass index (BMI) is a primary predictor of eating disorder symptoms, specifically in men.<sup>16</sup> Food addiction, or compulsive overeating of certain foods (i.e., high fat, high sugar), has received increasing attention in the eating disorder literature, though it is not yet a formal diagnosis. The high rates of SUDs in veteran populations, and the possibility that food addiction and SUDs may co-occur, given their shared biological mechanisms, indicate that this construct may be relevant to veterans.<sup>17,18</sup> Further, recent studies have also found high rates of food addiction among individuals with obesity and binge eating disorder (BED).<sup>18</sup>

Taken together, research suggests that veterans and sexual minority individuals may be at greater risk for disordered eating than previously assumed, but there is a general paucity of research examining disordered eating among both veterans and sexual minority individuals. Some early findings in civilian populations suggest that gay men and heterosexual women have greater body dissatisfaction and therefore increased risk of eating disorder symptomatology compared to heterosexual men and lesbian women.<sup>13</sup> More recent research comparing disordered eating behaviors of sexual minority men to heterosexual men suggests that sexual minority men are at increased risk of disordered eating.<sup>6</sup> Moreover, relative to heterosexual men, gay men have demonstrated increased vulnerability to body

dissatisfaction, greater drive for thinness, dieting frequency, and bulimic behaviors.<sup>20</sup> Research has also suggested that differences in body mass index (BMI) may exist between heterosexual and sexual minority men. Evidence suggests that sexual minority men have lower BMIs relative to heterosexual men and also are less likely to be overweight or obese, although the potential factors accounting for these observations are not well understood.<sup>21</sup> These findings highlight the importance of studying disordered eating among sexual minority men.

In particular, to our knowledge, no study has examined disordered eating among sexual minority veterans. Moreover, there are no published investigations of sexual orientation and food addiction. The current study aimed to compare 1) BMI; 2) eating disorder symptoms, including anorexia, bulimia, and BED symptomatology; and 3) food addiction, between heterosexual and sexual minority male veterans. Although sexual minority veterans comprise a relatively small segment of the veteran population, data describing the phenomenology of disordered eating in underrepresented populations may enrich models of risk, enhance prevention and screening efforts, and inform strategies for the development of eating disorder interventions.

## 2. Method

### 2.1 Participants

Participants in the current study were from a larger study of veterans ( $N = 3,156$ ) from the population-based Knowledge Networks-GfK Research Panel.<sup>22</sup> Of the cohort of 2,175 veterans who reported trauma exposure in the original study, 1,126 were randomly selected and invited to participate in a survey of PTSD, dissociation, and disordered eating. Of these individuals, a total of 787 male veterans and 73 female veterans responded ( $N = 860$ ).

Participants were excluded from the current analyses if their responses to questions were deemed invalid. Specifically, 142 were omitted because they completed the survey either so quickly ( $< 15$  minutes;  $n = 6$ ) or so slowly ( $> 2$  hours,  $n = 136$ ) compared to the average participant, that it raised doubt about the validity of the assessments, and 23 were eliminated because they achieved a T-score of 90 or greater on an index of symptom over-reporting (the revised Infrequency Psychopathology [Fp-r] validity scale on the Minnesota Multiphasic Personality Inventory-2 Restructured Form).<sup>23</sup> Two participants were omitted from analyses because they achieved an Fp-r T-score of 90 or greater and took over two hours to complete the survey. We excluded women ( $n = 55$ ) from these analyses, given that the subsample was too small to make comparisons by sex, resulting in a final analysis sample of 642 men.

### 2.2 Procedure

The Knowledge Networks-GfK Research Panel, which includes over 80,000 households, is recruited through probability-based sampling methods that cover approximately 98% of the population. Households without internet access are provided with internet access and hardware if needed. Participants in the panel are recruited to individual web-based studies via email and provided with incentives for study completion, including points that can be redeemed for prizes, cash rewards, and raffles. Post-stratification weights were computed

based on demographic characteristics (age, gender, race/ethnicity, education, census region, and metropolitan area) of US veterans in the GfK Knowledge Networks survey panel, which is based on the 2013 US Census data. A previous study found that the demographic characteristics, including sex, age, race/ethnicity, and education level, of this cohort are highly similar to those of veterans in the 2013 US census.<sup>24</sup> The sample weights for the current study also accounted for selection based on trauma exposure.

The survey took an average of 36.5 minutes ( $SD = 17.7$ ) to complete, and participants were awarded 50,000 points (approximately \$50) for completion. The survey was available for approximately two weeks. The act of completing the survey implied consent; the local human subjects review board approved all study procedures.

## 2.3 Measures

**2.3.1. Eating Disorder Diagnostic Scale (EDDS)**—The EDDS is a 22-item self-report survey of anorexia, bulimia, and binge eating symptomatology experienced in the past three to six months.<sup>25</sup> This measure is based on the *Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV)*<sup>26</sup> and yields probable diagnoses and continuous, composite scores. We modified the diagnostic algorithms slightly to create *DSM-5* diagnoses, e.g., we excluded the amenorrhea item from the diagnosis of anorexia nervosa, as well as the composite score, and used the revised *DSM-5* frequency and duration criteria for bulimia nervosa and BED.<sup>27</sup> Two additional items on the EDDS assess height and weight and were used to calculate BMI. The measure's developers reported that the EDDS yields stable, internally consistent scores in community and university samples; Cronbach's alpha in the development sample was .89.<sup>25</sup> In the current study, Cronbach's alpha for the EDDS was .85.

**2.3.2. Yale Food Addiction Scale (YFAS)**—The YFAS is a 25-item measure designed to assess food addiction. Items were developed based on *DSM-IV* substance use disorder criteria and measures of other behavioral addictions (e.g., exercise, gambling, sex). YFAS questions assess addiction symptoms (i.e., tolerance, withdrawal, consuming larger amounts or over a longer period than intended; persistent desire or unsuccessful efforts to reduce consumption, much time spent obtaining, using, or recovering from the effects of consumption; giving up or reducing important activities because of consumption; clinically significant impairment or distress) with regard to high fat and high sugar food consumption in the past 12 months.<sup>18</sup> The YFAS yields a diagnostic score, based on presence of three or more addiction symptoms plus distress or impairment, and a continuous symptom count; the continuous score was used in the current analyses. The measure's developers reported that the YFAS had acceptable convergent and discriminant validity as well as internal consistency (Kuder-Richardson alpha = .86).<sup>28</sup> In the current study, Kuder-Richardson alpha for the YFAS was .73

**2.3.3. Sexual Orientation**—Sexual orientation was asked using a single question “Which of the following do you consider yourself?” Response options included “heterosexual or straight,” “gay or lesbian,” “bisexual,” and “other.” Due to small sample sizes, we collapsed these categories into heterosexual/straight and sexual minority.

## 2.4 Statistical Analysis

Weighted analyses were conducted in SAS 9.3 using SURVEY procedures. Unweighted analyses were conducted in PASW Statistics.<sup>29</sup> We present weighted and unweighted descriptive results below. As all of our participants were trauma-exposed, weighted results allow us to make inferences about the general population of male US veterans. In comparison, unweighted results are interpreted in the context of our trauma-exposed sample. Multiple linear regression models (unweighted) were used to test associations between sexual orientation and EDDS scores, YFAS scores, and BMI, respectively. Age and BMI were correlated with EDDS and YFAS scores; thus, models with the EDDS and YFAS as dependent variables included age and BMI as covariates; the model with BMI as the outcome controlled only for age.

## 3. Results

### 3.1 Descriptive Results

Participants were between 22 and 89 years of age ( $M = 64.11$ ;  $SD = 11.20$ ). A majority of the sample identified as Caucasian (85.5%), reported their marital status as married (78.2%), and had a Bachelor's degree or higher (44.1%). Men with valid data had significantly lower EDDS ( $t_{174.18} = -3.00$ ,  $p = .003$ ) and YFAS scores ( $t_{184.11} = -3.10$ ,  $p = .003$ ) than did participants with invalid data. There were no differences in rates of sexual minority status between those with versus without valid data ( $\chi^2 = .06$ ,  $df = 1$ ,  $p = .80$ ).

In the full sample, 1.9% of men met food addiction criteria; the weighted percentage was 1.23%. One male participant (0.2%; 0.1 weighted %) met criteria for anorexia nervosa according to the EDDS; 18 men (2.8%, 2.4 weighted %) received probable bulimia nervosa diagnoses, and 12 men (1.9%, 2.2 weighted %) received probable BED diagnoses. As shown in Table 1, the average BMI of the sample fell in the overweight range ( $M = 29.26$ ;  $SD = 7.97$ ). EDDS scores averaged 10.33 ( $SD = 17.07$ ), and mean YFAS scores for the full sample were 1.29 ( $SD = 1.75$ ). A total of 24 men (3.68 weighted %) reported that they were gay, bisexual, or considered themselves to be of another sexual minority category.

### 3.2 Regression Model Results

Results from our regression model are presented in Table 3. To examine whether sexual minority status was associated with elevated eating pathology among the whole sample, we regressed EDDS scores onto the dichotomous sexual orientation variable, with age and BMI as covariates. Sexual orientation was not significantly associated with BMI when controlling for age. However, sexual orientation was significantly associated with EDDS scores; younger age and higher BMI significantly predicted higher EDDS scores as well. Sexual minority orientation was significantly associated with higher YFAS scores, as was higher BMI.

## 4. Discussion

In the current study, we aimed to examine the associations between sexual orientation, and eating disorder symptoms and food addiction, among trauma-exposed male veterans. Our

findings revealed that sexual orientation was associated with eating disorder symptoms as well as food addiction scores among men. Although food addiction has not previously been investigated in relation to sexual orientation, these findings are consistent with the research literature demonstrating higher rates of eating disorders (including anorexia, bulimia, and BED) among gay and bisexual men, relative to heterosexual men.<sup>19</sup> Further, it is noteworthy that rates of probable eating disorders (as assessed with the EDDS) ranged from 0.1% to 2.4% among men. These rates suggest that veterans in our sample reported a clinically significant level of eating disorder symptoms. This finding speaks to the importance of better understanding disordered eating among male veterans.

The percentage of men meeting criteria for food addiction (as assessed with the YFAS) was relatively low (1.28 weighted %). The majority of previous studies of food addiction have focused primarily on female samples, and a recent meta-analysis found a higher prevalence of food addiction among women (12.2%) relative to men (6.4%).<sup>30</sup> However, these estimates included studies of participants seeking weight loss treatment, which may have elevated rates of food addiction. A recent study of participants in the general community reported a food addiction prevalence of 3.0% among men and 6.7% among women.<sup>31</sup>

Although the rates of food addiction in our sample of veterans appear low relative to estimates for the general population, additional examination of food addiction among veterans is warranted, especially for sexual minority veterans. Food addiction has been linked to obesity,<sup>18</sup> as well as PTSD, both of which are more prevalent among veteran samples compared to the general population.<sup>32,33</sup> Thus, addressing food addiction in sexual minority men as well as veterans in general, may serve to reduce obesity and improve overall health.

Finally, veterans in our sample reported, on average, BMIs at the high end of the overweight range, consistent with existing findings that many veterans struggle with overweight and obesity.<sup>32</sup> However, contrary to our hypothesis, we did not observe differences in BMI based on sexual orientation. It should be noted that post-hoc power analyses revealed that we had 62% power to detect differences in YFAS scores, 67% power to detect differences in EDDS scores, and only 11% power to detect differences in BMI between sexual minority and heterosexual men. These analyses should be replicated in a larger sample of veterans with greater sexual minority representation to examine any potential differences in BMI by sexual orientation. Examining potential interaction effects, such as age, gender, and BMI, with sexual orientation to determine whether these variables interact to predict eating disorder symptoms and/or food addiction would be another important direction for future research involving a greater number of sexual minority participants.

#### 4.1 Limitations

Results should be interpreted in the context of the following limitations. First, we utilized self-report assessments in order to explore multiple variables in a large sample. The literature suggests that interview-based assessments may produce a more accurate categorization of eating disorders than self-report, and that self-report measures may be less accurate in assessing severity of disordered eating symptoms.<sup>34</sup> However, in large cohort

studies, several factors, such as time and resource constraints, limit the utility of interview-based assessment.

Second, the cross-sectional nature of our study design did not permit the examination of causal relations between sociocultural variables and disordered eating. Future longitudinal designs could further examine the temporal nature of the proposed relations in the current study.

Third, our sample included only a small number of sexual minority participants, which is representative of the percentage of the general population identifying a sexual minority orientation.<sup>8</sup> It is possible that participants may have underreported sexual minority identity, considering the associated stigma and historical policies affecting sexual minority military members and veterans. Additionally, it is important to note that, given the history of trauma exposure of all participants in our sample, our regression model results may not generalize to the full population of veterans.

Finally, our decision to dichotomize the assessment of sexual orientation does not permit the examination and comparison of different sexual orientation subgroups. Research on disordered eating among bisexual individuals is limited in general and deserving of replication and further exploration.<sup>35</sup> Findings to date suggest that bisexual men report greater body dissatisfaction and increased eating disorder symptomology compared to heterosexual men, while no meaningful differences in body dissatisfaction or eating disorder symptoms appear between bisexual and gay men.<sup>35</sup> These findings underscore the need for additional attention in this area to bisexual individuals in general and bisexual veterans more specifically. Future research may benefit from a more comprehensive exploration of sexual orientation, and how specific understanding and expression of sexual attraction and behavior is related to disordered eating attitudes and behaviors.

Despite these limitations, the current study has several notable strengths, including the large sample of male veterans. Given the dearth of literature examining disordered eating behaviors and attitudes among sexual minority veterans, even these preliminary results targeting this specific, understudied subpopulation add to our understanding of these associations and suggest the importance of follow up with larger studies.

## 4.2 Conclusions

Our findings suggest that, among veterans with trauma exposure, sexual minority male veterans may experience increased rates of eating disorder symptoms and food addiction compared to heterosexual male veterans. These findings warrant further exploration in this area to better understand the risk of disordered eating among sexual minority male veterans, and specifically those with a history of trauma. Additional research is also needed to explore these associations among female veterans, as the subsample of sexual minority female veterans in our sample was not large enough to allow for meaningful inclusion in analyses. This evidence of potentially increased rates of disordered eating and food addiction among sexual minority veterans with trauma exposure necessitates better understanding in an effort to improve prevention and treatment efforts for this population.

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**Table 1****Weight and Eating Behavior by Sexual Orientation in Male Veterans**

	Total sample			Heterosexual subsample			Sexual minority subsample		
	Weighted mean (SD)	Unweighted mean (SD)	Weighted mean (SD)	Unweighted mean (SD)	Weighted mean (SD)	Unweighted mean (SD)	Weighted mean (SD)	Unweighted mean (SD)	
BMI	29.26 (7.97)	29.35 (5.57)	29.26 (8.09)	29.33 (5.61)	29.56 (4.78)	30.13 (4.97)	29.56 (4.78)	30.13 (4.97)	
EDDS	10.33 (17.07)	10.68 (10.41)	10.05 (17.08)	10.47 (10.34)	17.64 (15.00)	15.92 (11.43)	17.64 (15.00)	15.92 (11.43)	
YFAS	1.29 (1.75)	1.28 (1.14)	1.27 (1.79)	1.26 (1.13)	1.83 (8.59)	1.83 (1.31)	1.83 (8.59)	1.83 (1.31)	

Note: BMI = body mass index; EDDS = Eating Disorder Diagnostic Scale; YFAS=Yale Food Addiction Scale.

Table 2

Regression Model Results

	BMI			EDDS			YFAS		
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Age	-.095	.191	<.001	-.106	.034	.002	-.006	.004	.142
BMI	--	--	--	.731	.395	<.001	.058	.008	<.001
Sexual orientation	.767	.026	.502	4.890	1.945	.012	.515	.227	.024

Note: BMI = body mass index; EDDS = Eating Disorder Diagnostic Scale; YFAS = Yale Food Addiction Scale; *B* = unstandardized regression coefficient, *SE* = standard error.