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RESEARCH ARTICLE



## Comparison of Medical Management versus Bariatric Surgery for Obesity Management: Effects on Sexual Function

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### ABSTRACT

Both bariatric surgery and medical modification approaches to weight loss for individuals with obesity have been evaluated for their impacts on sexual health, however, a comparison between these interventions has not been undertaken. A convenience sample of 52 females were recruited from community medical and surgical weight loss clinics to participate; 25 received medical management that consisted of dietary guidance and exercise training, and 27 received bariatric surgery. Participants completed self-report questionnaires before and after treatment that examined sexual functioning, sexual satisfaction, relationship satisfaction, depression, anxiety, and body esteem. Sexual functioning decreased in both groups regardless of weight loss approach,  $p = .037$ . Sexual satisfaction increased for both groups,  $p = .005$ , with significantly greater improvements seen in the medical management group,  $p = .038$ . Measures of sexual desire, arousal, and pain did not change after treatment, and there were no group or time effects on relationship satisfaction, depressive symptoms, or body esteem. Lubrication and orgasm function decreased over time for both groups. These results highlight that sexual satisfaction can improve with either weight loss approach, even when sexual function decreases.

### Introduction

Obesity among women affects important aspects of life including general health, mental health, quality of life, self-esteem, and body image as well as many facets of sexuality (Applegate & Friedman, 2008; Conason, et al., 2017; Kinzl et al., 2001; Sarwer et al., 2013; Sarwer & Steffen, 2015). In this paper we define sexual functioning as the ability to experience pleasure in a sexual encounter or reach orgasm; sexual desire as the motivation to engage in sexual activity; and sexual arousal as the physical, and to a less extent psychological changes to the body during a sexual encounter. Weight loss remains a major goal of those impacted by obesity, largely for the health prevention effects of weight loss. Among the various approaches to obesity management, medical management and bariatric surgery are two of the most evidence-based. Among the various reasons leading one to choose either medical management or bariatric surgery (Sarwer et al., 2013), women who have lower health and weight-related quality of life and who have a higher body mass index (BMI) were more likely to choose bariatric surgery (Sarwer et al., 2013). The effects of these different weight loss methods on sexual health remains unknown.

Given the often-profound effect of significant weight loss on many aspects of social and psychological health (Burgmer et al., 2014), effects of different weight loss methods on sexual function is of great interest. Sexual health is a major aspect of global health and a core aspect of well-being. As such, the effects of weight loss on sexual function are important to consider. Data suggest that weight loss, either through bariatric surgery (Applegate & Friedman, 2008; Brunault et al., 2015; Conason et al., 2017; Sarwer & Steffen, 2015; Sarwer et al., 2018; van Hout et al., 2005) or medical management (Aversa et al., 2013; Werlinger, et al., 1997) improves sexual functioning, however different mechanisms of action might account for their impacts on sexual health. Unfortunately, there are very few studies that directly compare the effects of weight loss treatments on sexual functioning.

Along with effects of weight loss treatment, we must consider the relationship between obesity, itself, on sexual function. Obesity is commonly associated with metabolic syndrome, which is characterized by sequelae like decreased high-density lipoprotein cholesterol, elevated triglycerides, elevated blood pressure, and hyperglycemia (Vignozzi et al., 2014). As metabolic syndrome increases, there are significant alterations to sex-related hormones (Morelli et al., 2014). Research on both male and female mice has found that when eating the same high fat diet, female mice had significantly higher metabolic impairment than their male counterparts, which has implications for human females (Robison et al., 2020). Metabolic syndrome is linked to hypogonadism, as well as an under-secretion of luteinizing hormone and follicle-stimulating hormone by the gonadotropic cells, resulting in impacted sexual functioning (Morelli et al., 2014; Vignozzi et al., 2014).

Vascular function adds another complexity to the relationship between obesity and sexual functioning. Having metabolic syndrome puts obese women at risk for clitoral vascular resistance which negatively impacts blood flow to the clitoris (Maseroli et al., 2016), and ultimately leads to difficulties becoming sexually aroused and cultivating sexual desire (Maseroli et al., 2016; Smith et al., 2019). Similar patterns have been found in men with obesity with vascular dysfunction affecting erectile function (Corona et al., 2014).

The presence of an eating disorder might also influence the relationship between obesity and sexual functioning (Panza, et al., 2021). Even subclinical eating disorders contribute to concerns about weight and shape and body consciousness which are relevant to sexual functioning (Castellini et al., 2010) and reduced sexual desire (Smith et al., 2019) due, in part, to increases in body insecurity while engaging in a partnered sexual activity. As a way to reduce these insecurities, these women may avoid sexual situations where attention is focused on their bodies (Smith et al., 2019).

On the other hand, weight loss might also improve sexual function. For example, increases in endothelial function in women were correlated with improved sexual functioning (Aversa et al., 2013). However, this increase in endothelial function was only seen after 16 weeks post-treatment, leaving the longer term benefits of weight loss unknown. Aversa et al. (2013) concluded that women who went through a medical management intervention by learning about healthy nutrition, exercising and fixing unhealthy eating patterns had more improved sexual functioning than those who went through bariatric surgery (Aversa et al., 2013). While this study does provide valuable insight on the outcomes of sexual functioning when comparing medical management to bariatric surgery, it does not focus on potential mediators of change.

Weight loss, while being associated with improved sexual arousal and desire, may not be a direct predictor of improved overall sexual functioning (Conason et al., 2017; Kinzl et al., 2001). BMI is not a predictor of changes in one's sexual functioning, whereas body image and depression, as well as relationship factors, are found to be the strongest predictors of the effects of weight loss on overall sexual functioning (Conason et al., 2017; Sarwer et al., 2013). Psychosocial distress is a major predictor of sexual functioning (Sarwer et al., 2013), and even very significant weight loss does not always improve sexual functioning because ongoing symptoms of depression and negative body image can override the weight loss and limit its beneficial effects on sexual functioning and overall quality of life (Brunault et al., 2015).

The majority of the research done on the topic of weight loss and sexual functioning has focused on one type of weight loss method. Regarding bariatric surgery, many women experience improvements in their sexual functioning after surgery including increased arousal, desire, lubrication and satisfaction (Applegate & Friedman, 2008; Brunault et al., 2015; Conason et al., 2017; Sarwer & Steffen, 2015; Sarwer et al., 2018; van Hout et al., 2005). Despite these positive outcomes, many factors limit or affect this success in the long term. Although there are commonly improvements in depression, weight-related quality of life, body image and sexual functioning two years afterwards (Sarwer et al., 2018), at three years post-op, these improvements start to plateau, and as individuals reach four years post-op, all these areas of improvement fall to pre-treatment levels. This sudden drop is due to weight regain—a common, and sometimes inevitable fate after bariatric surgery (Sarwer & Steffen, 2015; Sarwer et al., 2018).

Medical management involves a different approach to weight loss, but the underlying mechanisms by which it affects sexual function may be the same. It is likely that by learning about the importance of exercise, having healthy relationships with food and meeting with a psychiatrist (Aversa et al., 2013) contribute to better body image, and thus greater improvements in body satisfaction, sexual desire, and satisfaction (Conason et al., 2017; Werlinger et al., 1997).

Taken together, the existing literature suggests that both surgery and medical management for weight loss positively impact sexual health outcomes. However, because a medical management approach to weight loss more directly relies on self-efficacy, and underlying psychological factors that might be relevant to sexual health, we hypothesized that the effects of weight loss due to medical management might have a more pronounced effect on improving domains of sexual health compared to bariatric surgery.

## Methods

### Participants

Participants were recruited from multiple patient pools of medical and surgical weight loss clinics. Approximately 200 patients seeking weight loss management were informed about the study and invited to participate by a nurse at the clinic. The majority of participants were recruited from the Revolution Medical Clinic in a major metropolitan center (96.8%) and the remaining participants were recruited from a similar clinic in a smaller city (3.2%). The Revolution Medical Clinic offers a multidisciplinary medically supervised weight loss program using behavioral therapy, diet and exercise advice, support, and pharmacotherapy when necessary. Participants were thoroughly informed about the benefits and potential risks that are involved with participating in the study by a doctor, followed by a description of the procedures, eligibility criteria, and confidentiality protocols. It was emphasized that participation in the study was voluntary and that participants could withdraw at any time without any negative consequences to them or their treatment.

Eligibility included: identifying as female, and being willing to complete the questionnaires at two time points. The clinic medical office assistant mailed the package of questionnaires to every booked patient, along with a consent form, and they had the opportunity to return their signed consent form and completed questionnaires at their clinical visit. When completing their questionnaire, a unique study ID was assigned to each participant to ensure their identity remained anonymous. Given the observational nature of the study, there was no *a priori* sample size calculation.

### Measures

#### Sexual functioning

To measure sexual functioning, the Female Sexual Function Index (FSFI) was used (Rosen et al., 2000). The FSFI consists of 19 questions that cover sexual satisfaction, desire, arousal, lubrication

during sexual encounters, orgasm, and discomfort during sex, and we added one item assessing frequency of sex (Rosen et al., 2000). We analyzed all five subscales except sexual satisfaction as we elected for a more comprehensive measure of sexual satisfaction. Cronbach's alpha was very good ( $\alpha = .93$ ) for the FSFI total score.

### **Sexual satisfaction**

Sexual satisfaction was measured using the Global Measure of Sexual Satisfaction (GMSEX; Lawrance & Byers, 1998). Using this measure, participants rate their sexual relationship with their partner on five, 7-point scales ranging from less satisfaction to high satisfaction. The five scales include: very bad–very good; very unpleasant–very pleasant; very negative–very positive; very unsatisfying–very satisfying; worthless–very valuable (Lawrance & Byers, 1998). Cronbach's alpha was very good ( $\alpha = .94$ ) for the GMSEX.

### **Relationship satisfaction**

The Global Measure of Relationship Satisfaction (GMREL) was used to measure participants' relationship satisfaction (Lawrance & Byers, 1998). It is identical to the GMSEX except instead of rating one's sexual relationship, participants rate their relationship to their partner. Cronbach's alpha was very good ( $\alpha = .96$ ) for the GMREL.

### **Depression**

Depression in participants was measured by the Patient Health Questionnaire-9 (PHQ-9; Kroenke & Spitzer, 2002). The PHQ-9 is a reliable measure of depression as it is based upon the same guidelines set by the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*. The PHQ-9 consists of nine items that are rated on a scale between "not at all" (0) to "nearly every day" (3). Major depressive disorder can be proposed if five items are reported as "more than half the days" or if either item one or two are reported as "more than half the days" (Kroenke, et al., 2001). Cronbach's alpha was good ( $\alpha = .88$ ) for the PHQ-9.

### **Anxiety**

To measure participants' anxiety, the Beck Anxiety Inventory was used (BAI; Beck et al., 1988). The BAI consists of 21 items of anxiety symptoms that participants can rate on a scale from "not at all" (0) to "severely" (3). To assess anxiety levels of participants who complete the BAI, their scores for the 21 items are summed and a suggested anxiety diagnosis can be suggested. A score of 0-21 represents low anxiety, a score of 22-35 suggests moderate anxiety and a score of 36 and above suggests a high and potentially concerning level of anxiety (Beck et al., 1988). Cronbach's alpha for the BAI was very good at  $\alpha = 0.862$ .

### **Body esteem**

Body esteem was measured through the Body Esteem Scale (BES; Franzoi & Shields, 1984). The BES consists of 35 items ranging from physical traits to items about physical abilities. Participants rate how they feel about each item on a scale from one (have strong negative feelings) to five (have strong positive feelings; Franzoi & Shields, 1984). After summing all the scores, the higher a participant's score is, the more positive their body esteem is and vice versa. Cronbach's alpha was good ( $\alpha = .89$ ) for the BES.

### **Menopause symptoms**

The Menopause Rating Scale (MRS) was used to assess the clinical symptoms of menopause (Heinemann et al., 2004). The MRS list 11 symptoms of menopause and participants rate the severity of those symptoms for themselves on a scale from "none" (0) to "very severe" (4). The

MRS is a highly reliable and valid source for accurately determining a woman's menopausal state (Heinemann et al., 2004). Cronbach's alpha was good ( $\alpha = .80$ ) for the MRS.

### **Procedure**

Participants in the bariatric surgery group underwent either sleeve or Roux-en-Y gastric bypass surgery. Patients in the medical management group participated in monthly visits which focused on behavioral therapy and pharmacotherapy for obesity. Visits focused on goal setting, food diary, mindful eating and action planning around nutritional change and exercise. Medications were used when clinically necessary. After participants completed consent forms, data were gathered at two specific points in time: at the initial consultation (baseline), and three months post-intervention (either after surgery or after the last medical management appointment). All participants provided written and signed consent prior to completing the questionnaires. The study was reviewed by the Behavioral Research Ethics Board at the University of British Columbia.

### **Data Analysis**

Descriptive analyses were used to characterize the sample. We also used Independent Samples t-tests to compare the two groups on continuous variables, and Chi-Square tests of significance to compare categorical variables at baseline. To evaluate the impact of treatment on sexual health outcomes, we conducted a series of between-within repeated measures analyses of variance (ANOVA) with time as the within subjects' factor and treatment as the between subjects' factor. We tested for violations of sphericity and used an adjusted Greenhouse-Geiser in cases of violation of the sphericity assumption. Since the five domains of the FSFI are correlated, we applied a Bonferroni correction (.05/5) of  $p = .01$  for statistical significance on FSFI outcomes. Given that some participants had missing data at time 2, we imputed missing data.

## **Results**

### **Comparison between groups on demographic and clinical variables**

All of the participant descriptive data are presented in Table 1. A total of 52 participants participated in the study. Out of these 52, 25 were in the medical management group and 27 were in the bariatric surgery group. Participants in the medical management group and the bariatric surgery group did not significantly differ in pretreatment weight  $t(50) = -0.639, p = 0.526$ . Participants in both the medical management and bariatric surgery groups did not significantly differ in height  $t(49) = -0.089, p = 0.929$ . There was no significant difference in the age of the participants between groups,  $t(50) = -1.111, p = 0.272$ .

The majority of participants in the medical management group and the bariatric surgery group were Euro-Caucasian, with no significant differences between the groups regarding ethnicity,  $\chi^2(3) = 2.04, p = .564$ . The majority of participants in the medical management group and the bariatric surgery group were employed full time, with no significant differences between the groups concerning employment,  $\chi^2(5) = 1.61, p = .90$ . In regard to sexual orientation, the majority of participants in the medical management group and the bariatric surgery group were heterosexual with no significant differences between the groups,  $\chi^2(2) = 0.245, p = .89$ . The majority of participants in both groups were married/cohabitating and there were no significant differences between the groups with respect to relationship status  $\chi^2(3) = 1.33, p = .72$ . The two groups did not differ in their relationship lengths  $t(41) = 0.706, p = 0.484$  and months  $t(41) = 1.021, p = 0.313$  or relationship satisfaction  $t(40) = -0.006, p = 0.995$ .

The two groups were compared with regards to the proportion from each that had a variety of medical diseases. The groups were found not to differ in frequency of type 1 diabetes,  $\chi^2(1) = 2.34, p = 0.126$ , but the surgical group had higher rates of type 2 diabetes,  $\chi^2(1) = 6.29,$

**Table 1.** A comparison of participant characteristics in the medical management (n=25) and bariatric surgery (n=27) groups.

Demographic Variable	Medical	Surgical
Weight	x = 255.73; SD = 50.99	x = 265.38; SD = 57.52
Height	x = 4.96; SD = 2.34	x = 5.02; SD = 2.45
Age	x = 40.6; SD = 11.46	x = 43.89; SD = 9.88
Relationship Length (yrs)	x = 14; SD = 13.16	x = 11.5; SD = 9.91
Relationship Length (mo)	x = 4.38; SD = 3.73	x = 3.23; SD = 3.67
Relationship Satisfaction	x = 6.45; SD = 2.61	x = 6.45; SD = 2.44
Ethnicity		
Euro-Caucasian	87.5%	92.59%
East-Asian	4.16%	0%
South-Asian	4.16%	0%
Indigenous	0%	3.7%
Other	4.16%	3.7%
Employment		
Full Time	56.52%	57.69%

$p=0.012$  as well as hypertension,  $\chi^2(1) = 4.69$ ,  $p=0.030$ . There were no significant differences between the medical management group and the surgical group in the proportion of participants with high cholesterol,  $\chi^2(1) = 0.518$ ,  $p=0.472$ , dyslipidemia,  $\chi^2(1) = 1.85$ ,  $p=0.174$ , arthritis,  $\chi^2(1) = 2.20$ ,  $p=0.138$ , heart disease,  $\chi^2(1) = 1.15$ ,  $p=0.284$ , or history of strokes,  $\chi^2(1) = 0.492$ ,  $p=0.483$ . The surgical group had higher rates of both depression,  $\chi^2(1) = 7.40$ ,  $p=0.007$ , and obstructive sleep apnea,  $\chi^2(1) = 6.25$ ,  $p=0.012$  compared to the other group. None of the participants had peripheral vascular disease. The two groups did not differ in the proportion of women who were postmenopausal,  $\chi^2(2) = 1.75$ ,  $p = .416$ , or in the proportion who smoked,  $\chi^2(1) = 0.002$ ,  $p=0.965$ .

### **Comparison between groups on baseline sexuality-related variables**

One participant from the medical management condition and three from the bariatric surgery condition reported having received treatment for sexual concerns in the past, but these differences were not statistically significant,  $\chi^2(1) = 0.336$ ,  $p=0.611$ . The vast majority of both the medical management group and the bariatric surgery group reported being sexually active in the past year resulting in no significant differences between the groups  $\chi^2(1) = 0.936$ ,  $p=1.000$ . There were also no significant differences between the medical management group and the surgical group in self-reports of recent sexual activity,  $\chi^2(1) = 0.629$ ,  $p=0.740$ .

Weight significantly reduced overall with treatment  $F(1,23) = 6.895$ ,  $p = .015$ , with no time by group interaction,  $F(1,23) = 0.177$ ,  $p = .678$ . There was also an overall effect of group,  $F(1,23) = 5.525$ ,  $p = .028$  with those in the bariatric group having higher weight overall (at both time points) than those in the medical management group.

### **Effects of treatment on sexuality-related and relationship variables**

The interaction between time and group was not significant for the FSFI total score,  $F(1,35) = 0.959$ ,  $p = .334$ , whereas the main effect of time was significant,  $F(1,35) = 4.701$ ,  $p = .037$ , with scores significantly decreasing from pre- to post-treatment. There was no significant main effect of group,  $F(1,35) = 0.265$ ,  $p = .610$ .

There was an interaction between time and group for sexual satisfaction,  $F(1,36) = 4.603$ ,  $p = .038$  such that scores significantly increased to a greater extent in the medical management compared to the surgical group. There was also a main effect of time,  $F(1,36) = 9.136$ ,  $p = .005$  with scores increasing overall, in both groups and no significant main effect of group,  $F(1,36) = .592$ ,  $p = .447$ .

The interaction between time and group for the FSFI desire subscale  $F(1,49) = 0.769$ ,  $p = .385$  and the main effect of time  $F(1,49) = 1.174$ ,  $p = .284$  was not significant. There was also no significant main effect of group,  $F(1,49) = 0.260$ ,  $p = .612$ .

For the FSFI arousal subscale there was no significant time by group interaction,  $F(1,40) = 0.269, p = .607$ ; main effect of time,  $F(1,40) = 2.985, p = .092$ , nor main effect of group,  $F(1,40) = 0.562, p = .458$ .

The interaction between time and group was not significant for the FSFI lubrication subscale,  $F(1,40) = 0.905, p = .347$ . There was a main effect of time,  $F(1,40) = 16.067, p < .001$  with scores decreasing over time and there was no main effect of group,  $F(1,40) = 0.294, p = .591$ .

There was no significant interaction between time and group for the FSFI orgasm subscale,  $F(1,41) = 1.069, p = .301$ . There was a main effect of time,  $F(1,41) = 5.163, p = .028$  with scores decreasing overall. The main effect of group was not significant,  $F(1,41) = 0.715, p = .403$ .

The interaction between time and group for the FSFI pain subscale  $F(1,28) = 2.891, p = .100$  was not significant. There was also no significant main effect of time  $F(1,28) = 0.168, p = .685$  nor main effect of group,  $F(1,28) = 0.260, p = .612$ .

For relationship satisfaction, there was no significant time by group interaction,  $F(1,38) = 0.786, p = .381$ ; main effect of time,  $F(1,38) = 1.933, p = .173$ , nor main effect of group,  $F(1,38) = 0.11, p = .916$ .

### **Effects of treatment on psychological variables**

The interaction between time and group was not significant for body esteem,  $F(1,47) = 0.365, p = .842$ . There was also no main effect of time,  $F(1,47) = 0.365, p = .548$ , nor main effect of group,  $F(1,47) = 2.728, p = .105$ .

Depressive symptoms did not show an interaction between time and group,  $F(1,47) = 1.015, p = .319$ , nor main effect of time,  $F(1,47) = 0.963, p = .332$ . Moreover, the main effect of group was not significant,  $F(1,47) = 1.777, p = .189$ .

## **Discussion**

The main aim of this study was to examine and compare two different weight loss methods and their impact on women's sexual health— medical management and bariatric surgery. Overall, we found that both treatments led to significant improvements in sexual satisfaction, however these effects were greater in the medical management group. There were also main effects of time (not treatment) with treatment leading to significant decreases in overall sexual function, lubrication, and orgasm.

The results provide preliminary evidence that a medical management approach to weight loss can increase sexual satisfaction more so than a surgical approach. Despite this positive effect of treatment, the overall sexual functioning of both groups decreased after treatment, as well as reductions in self-reported lubrication and orgasm. There were no changes in desire, arousal, or genital pain.

Although these findings may appear contradictory, it is important to note that sexual functioning is independent from satisfaction and can be described as a distinct facet of sexual wellbeing (Ferrer-Márquez et al., 2017). Sexual functioning may pertain more to the functional aspects of sexual response whereas sexual satisfaction is based on how one feels about the quality and enjoyment of their sexual experiences. It is important to note that even people who have low sexual functioning can be sexually satisfied (Ferrer-Márquez et al., 2017). Although sexual functioning did not improve, participants' ideas about sex and what constitutes satisfactory sex, both of which contribute to sexual satisfaction (Ferrer-Márquez et al., 2017) may have changed over the course of the study resulting in greater sexual satisfaction outcomes.

It is also possible that low mood may have contributed to the lack of improvements in sexual functioning, and indeed we did not see any changes in participants' depressive symptoms post weight loss for either group. Others similarly found that weight loss alone is not sufficient for sexual desire to increase (Brunault et al., 2015). Instead, it is likely that changes in depression, from weight loss, are a more potent predictor of desire (Brunault et al., 2015). Because



participants in this study did not show significant changes in their depressive symptoms, this may have attenuated any improvements that would have otherwise been seen with sexual desire and arousal.

The lack of change in body esteem might have also attenuated any improvements in sexual functioning given that body image and sexual desire are related regardless of weight loss (Brunault et al., 2015). Combined with ongoing depressive symptoms, participants' overall unchanging negative body esteem may also explain the decrease in sexual functioning from pre- to post-treatment. Although we did not measure participants' baseline expectations about weight loss, such expectations are known to affect body esteem (Applegate & Friedman, 2008). Though both groups experienced significant weight loss, if such loss did not meet expectations, then it is likely that this would have kept body esteem low, and hence, negatively affect sexual functioning outcomes.

In this study we found that depression was higher in the surgical group than in the medical management group at baseline, consistent with past findings (Brunault et al., 2015). The higher rates of depression in the surgical group might explain why that group did not show the same increase in sexual satisfaction seen in the medical management group. Since the relationship between depression and sexual satisfaction is complex and not uni-directional (Fabre, et al., 2011), we can't rule out the possibility that the group differences in sexual satisfaction (after treatment) might also account for the group differences in depressive symptoms. Furthermore, the fact that the surgical group had significantly higher proportion of type 2 diabetes, hypertension, and sleep apnea compared to the medical management group might also have contributed to the group differences in sexual satisfaction.

While the findings from this study reveal important information about sexual health outcomes of medical management and bariatric surgery approaches to weight loss, we recognize it also has some limitations. We were only able to analyze the data at baseline and at one post-treatment time point. Although we attempted to gather longitudinal follow-up data, we found that retention of participants was a significant challenge, and most elected to not continue their participation. Given evidence that sexual functioning might see a delayed response since body esteem can take up to three years after treatment to reach its peak (Aversa et al., 2013; Sarwer et al., 2018), this suggests that longer term follow-up is needed. Another significant limitation of the study was the highly select sample who opted to participate. This was not a random sample, and there were group differences at baseline.

As this study was based on survey responses, we did not analyze hormone changes. Androgens have been found to be important components in the sexual functioning of women, with lower levels of these hormones being associated with reduced sexual desire in some studies (Clayton et al., 2018; Wåhlin-Jacobsen et al., 2015). Given the potential for weight-loss effects on hormones, future studies should attempt to measure these alongside self-report outcomes.

Future research should also focus on the direct effects of physical activity and its impact on sexual functioning during weight loss, and how this might have differed between the groups. For example, studies have shown that being physically active is associated with not only increased sexual frequency but also reduces one's risk for sexual dysfunction (Grabovac et al., 2020; Mollaioli et al., 2020). Consistent physical activity also leads to increases in positive body image for women, equipping them with more confidence to engage in sexual activity (Mollaioli et al., 2020).

Finally, we did not assess lower urinary tract function (LUTS) in participants, yet LUTS is important to consider when discussing obesity and sexual functioning because of its positive association with metabolic syndrome (Vignozzi, et al., 2016) and the finding that it predicts sexual dysfunction in women and men (Hansen, 2004). Women with LUTS may avoid sex because of the discomfort and embarrassment that may come along with incontinence during sexual activity (Hansen, 2004).

In conclusion, this small study based on a convenience sample suggests that medical management leads to greater improvements in sexual satisfaction than those receiving bariatric surgery for weight loss, despite the fact that both groups saw an overall decrease in total sexual function. Although further studies are needed to examine the long-term sexual health effects of

these weight loss interventions, this research can help bring awareness to clinicians about the sexual health outcomes of medical management and surgical interventions which will allow patients to be better informed about how weight loss might impact different facets of their sexual health.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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