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Short- and Long-Term Changes in Health-Related Quality of Life with Weight Loss: Results from a Randomized Controlled Trial

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Abstract

Objective—To determine the effects of weight loss and weight loss maintenance (WLM) on weight-specific health-related quality of life (HRQOL) in a 66-week trial.

Methods—Adults with obesity ($N=137$, 86.1% female, 68.6% black, mean age=46.1 years) who had lost 5% of initial weight in a 14-week intensive lifestyle intervention/low-calorie diet (LCD) program were randomized to lorcaserin or placebo for an additional 52-week WLM program. The Impact of Weight on Quality of Life (IWQOL-Lite) scale (including five subscales), Patient Health Questionnaire-9 (depression), and Perceived Stress Scale were administered at the start of the 14-week LCD program, randomization, and week 52 of the randomized controlled trial (RCT; i.e., 66 weeks total).

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Results—Significant improvements in all outcomes, except weight-related public distress, were found following the 14-week LCD program ($p < 0.05$). Improvements were largely maintained during the 52-week RCT, despite weight regain of 2.0–2.5 kg across treatment groups. Participants who lost 10% of initial weight achieved greater improvements in physical function, self-esteem, sexual life, and the IWQOL-Lite total score than those who lost <5%, and did not differ from those who lost 5–9.9%.

Conclusions—Improvements in weight-specific HRQOL were achieved with moderate weight loss and sustained during WLM.

Keywords

Quality of life; psychosocial; obesity; weight loss

Introduction

High-intensity lifestyle interventions induce losses of 5–10% of initial body weight that are associated with improvements in cardiovascular disease (CVD) risk factors (1,2). These losses also are associated with improvements in health-related quality of life (HRQOL), commonly measured by the Short Form 36 Health Survey (SF-36)(3). On the whole, weight loss is associated with improvements in physical HRQOL but little to no improvement in mental HRQOL, as assessed by the SF-36 (4–7). Relatedly, studies have found small to minimal improvements in depressive symptoms and perceived stress following lifestyle intervention (8–13).

In addition to general HRQOL, aspects of weight-specific HRQOL frequently are assessed by the Impact of Weight on Quality of Life Scale – Lite (IWQOL-Lite), which consists of a total score and five subscales: physical function; self-esteem; sexual life; work; and public distress about one's weight (14). Greater weight loss is typically associated with increased (i.e., improved) total scores on the IWQOL-Lite (15–19). Results are less consistent for changes on the IWQOL-Lite subscales. Some studies have shown positive effects of weight loss interventions across all subscales (17,20); others have found benefits most consistently for physical functioning (17–21); while some studies also have shown benefits for other subscales such as self-esteem (17,18) and sexual life (15–17,19).

Patients typically do not report additional improvements in HRQOL when acute weight loss ends, after approximately 6 to 9 months, and weight loss maintenance begins. Maintaining weight loss is widely known to be less innately rewarding than losing weight (16,22). Moreover, following completion of a high-intensity lifestyle intervention, individuals with obesity are vulnerable to weight regain, which may be associated with deterioration in HRQOL (and CVD risk factors) (23, 24). Thus, novel interventions are needed to sustain long-term weight loss, in order to maintain improvements in HRQOL and other health outcomes.

The current study examined whether lorcaserin, a serotonin 2C receptor agonist approved for chronic weight management (25,26), would facilitate the maintenance of weight loss and improvements in weight-specific HRQOL and related psychosocial outcomes. Specifically,

we examined changes in weight-specific HRQOL, depression, and perceived stress in patients who had lost 5% or more of initial weight during a 14-week intensive lifestyle intervention that included a low-calorie diet (LCD). We anticipated that participants would achieve substantial improvements in these outcomes, particularly in physical health aspects of HRQOL, at the end of this 14-week intervention. Thereafter, we hypothesized that participants randomly assigned to receive lorcaserin for the ensuing 52 weeks would maintain larger weight losses and, thus, significantly greater improvements in weight-specific HRQOL than those assigned to placebo. Consistent with prior studies (7, 15), we also expected that, independent of treatment condition, larger weight losses would be associated with greater improvements in weight-specific HRQOL at the end of the trial.

Methods

Study Design

As described previously (27), this was a two-phase weight loss maintenance trial. Participants attended a 14-week, non-randomized, intensive lifestyle intervention/LCD program (i.e., phase 1), followed by a 52-week double-blind randomized controlled trial (RCT; i.e., phase 2) for participants who lost $\geq 5\%$ of initial weight during phase 1. The study protocol was approved by the university's institutional review board, and a data and safety monitoring board provided trial oversight (27).

The current study represents a secondary analysis of the RCT, with primary findings reported previously (28). In sum, 137 participants completed the 14-week LCD program, lost $>5\%$ of initial weight, and accepted randomization in a 52-week RCT. Participants lost a mean $9.3 \pm 2.9\%$ of initial weight (10.7 ± 4.0 kg) during the 14-week LCD program, which was associated with clinically meaningful ($\geq 5\%$) improvements in cardiometabolic risk factors (e.g., blood pressure and insulin) (28). Participants in the two groups gained 2.0 ± 0.8 and 2.5 ± 0.8 kg, respectively, from randomization to week 52, with no significant differences between groups (28). Thus, lorcaserin did not significantly improve the maintenance of lost weight at the end of the 52-week trial. As measured from the start of the 14-week LCD program, lorcaserin and placebo-treated participants maintained losses at week 52 of the RCT (66 weeks in total) of $7.8 \pm 0.8\%$ and $6.6 \pm 0.9\%$ (9.4 and 7.5 kg), respectively ($p = 0.32$) (28). Additionally, the physical health component score of the SF-36 improved significantly from the start of the 14-week LCD program to week 52 (increase from 47.8 to 50.9, $p < .001$) but the mental health component score did not (increase from 51.0 to 51.3, $p = .71$) (28).

Participants

Adults with obesity were recruited (27) and were eligible for phase 1 if they were age 21–65 years, and had a body mass index (BMI) ≥ 33 kg/m² and ≤ 55 kg/m² (or ≥ 30 kg/m² and an obesity-related comorbidity). Exclusion criteria included serious medical conditions and current major depression or use of anti-depressants (27). Participants who did not lose $\geq 5\%$ of initial weight in phase 1 were not eligible for phase 2.

Procedures

During phase 1, participants were provided 14 weekly, 90-minute group lifestyle modification sessions. They were prescribed a structured 1000–1200 kcal/d diet that included the daily consumption of four meal replacement shakes (HMR 800), combined with an evening meal of a frozen-food (or shelf-stable) entrée, a garden salad, and two servings of fruit. Participants were instructed to record their daily food intake and increase their physical activity, as described previously (27).

Participants who completed the 14-week LCD program, lost 5% of initial weight, and wished to continue to participate were randomly assigned to lorcaserin or placebo (initiating phase 2). Participants also were provided group weight loss maintenance (WLM) counseling every-other-week for the first 12 weeks (i.e., 6 sessions) and once every 4 weeks for the remainder of the 52 weeks (i.e., 10 sessions). Approximately half of the sessions were conducted in person and the other half by teleconference, given the potentially greater convenience to participants of conference calls. Participants were instructed to consume a calorie-reduced diet of conventional foods based on current dietary guidelines in order to maintain their weight loss (although participants were allowed to continue to lose weight if desired). Participants also were instructed to increase their physical activity to 225 minutes/week by week 40 and to continue to monitor their food intake and weigh themselves at least once per week.

Study Outcomes

Weight-specific HRQOL and related psychosocial outcomes were assessed at baseline (prior to the start of phase 1), randomization (after completion of phase 1), and week 52 of phase 2. Measures included the IWQOL-Lite (14), the Patient Health Questionnaire (PHQ-9) (29), and the Perceived Stress Scale – 14 item version (30). The IWQOL-Lite includes five subscales that assess the effects of weight on physical function, self-esteem, sexual life, work, and public distress. A total score is also computed. Scores are transformed and range from 0–100, with higher scores signifying better QOL. The PHQ-9 is recommended by the American Psychiatric Association as an optimal, brief depression scale (31). Scores range from 0 to 27, with established cutoffs of 0–4 for minimal symptoms of depression, 5–9 for mild, 10–14 for moderate, 15–19 for moderately severe, and 20–27 for severe symptoms of depression (29). The Perceived Stress Scale assesses thoughts and feelings related to stressful events in the past month, with scores ranging from 0–56 (higher scores indicate greater perceived stress) (30). All scales were pro-rated to account for missing items. Height and weight were measured at screening, and weight was measured at all on-site group visits.

Statistical Analyses

Baseline means and changes from baseline to week 14 were calculated for all measures. Analysis of variance and logistic regression were used to test for differences in patient characteristics (demographics, height, and weight) by treatment condition at randomization; any characteristics that differed and were significantly associated with outcome measures were included in subsequent analyses that compared conditions.

Repeated measures analyses of variance (ANOVAs) were used to determine whether changes in weight-specific HRQOL measures from randomization (week 0) to week 52 differed by condition. Analyses were repeated to assess changes from the start of the LCD program (week -14) to week 52. Additionally, hierarchical linear regression models were used to determine the contribution of weight loss to changes in weight-specific HRQOL, depression, and perceived stress, controlling for variables that may be related to weight loss: demographics (age, race, gender); baseline body mass index (BMI); and treatment condition. Continuous predictor variables included in the regression analyses were centered at their means. Analyses of covariance (ANCOVAs) were used to determine the effects of losing <5%, 5–9.9%, and 10% of body weight on all weight-specific HRQOL outcomes, controlling for demographics, baseline BMI, and treatment condition. Post-hoc paired comparisons tested for differences in weight-specific HRQOL among the three levels of weight loss.

Results

Participant Characteristics

A total of 178 participants began phase 1 of the study. Of these participants, 143 lost 5% of initial weight during phase 1, and 137 accepted randomization into phase 2. At baseline, these 137 participants had a mean age of 46.1 ± 10.1 years, and the majority were female (86.1%) and black (68.6%; 24.1% white, 2.9% Asian, and 4.4% multiracial/other). Mean (\pm SD) BMI at baseline was 40.8 ± 5.9 kg/m². At randomization, all characteristics were evenly distributed between groups except for height. Height did not correlate significantly with changes in any HRQOL or psychosocial outcome and, thus, was not included as a covariate in between-group analyses of phase 2 data. Overall, 81.8% (112/137) of participants completed the week-52 assessment, including 59 of 69 (85.5%) assigned to lorcaserin and 53 of 68 (77.9%) to placebo (21).

Changes in Weight-Specific HRQOL Outcomes

Phase 1—At the end of the 14-week LCD program, participants reported significant improvements in the IWQOL-Lite total score, as well as the physical function, self-esteem, and sexual life subscales with baseline values increasing by approximately 9 to 13 points (see Table 1). Work scores also improved significantly (by 7.4 points), whereas the 2.4 point increase on the public distress subscale was not statistically significant ($p = 0.14$). PHQ-9 and Perceived Stress Scale scores decreased significantly (p values < 0.01) but modestly (2.5 and 1.8 points, respectively).

Phase 2—Randomization values (at the end of the 14-week LCD program) of weight-specific HRQOL and psychosocial measures did not differ significantly between the lorcaserin- and placebo-treated participants with one exception, as shown in Table 2. Public distress scores were significantly higher in the placebo than the lorcaserin group.

Table 3 shows that, at the end of the 52-week RCT, scores on the IWQOL-Lite scales remained close to their randomization values. For example, on the IWQOL-Lite total score, estimated marginal means increased from randomization by 0.1 points (on a 100-point scale)

in lorcaserin-treated participants, and 3.6 points for placebo. Repeated measures ANOVAs revealed that the difference between groups was not significant for changes between randomization and week 52 on the IWQOL-Lite total score or any of the subscales. When examining the main effect of time (thus collapsing across conditions), the public distress score improved significantly from randomization to week 52 ($p = 0.04$), with no other significant changes over time in any of the other IWQOL-Lite subscales.

PHQ-9 estimated marginal mean scores increased by 2.2 points from randomization to week 52 in lorcaserin-treated participants, which was significantly ($p < 0.01$) greater than the 0.1 increase in the placebo group. Marginal mean scores on the Perceived Stress Scale also increased slightly in both groups (1.5 and 0.8 points, respectively), with no significant differences between groups. Examining the main effect of time, the Perceived Stress Scale score did not change significantly from randomization to week 52. Altogether, during the 52-week RCT, weight-specific HRQOL and psychosocial outcomes did not change substantially from randomization values, with the exception of the modest improvement on the public distress subscale and a small increase in symptoms of depression among lorcaserin-treated participants.

Phases 1 and 2 combined—Participants in both the lorcaserin- and placebo-treated groups generally maintained large improvements on the various measures of weight-specific HRQOL, as assessed from the start of the 14-week LCD program (week -14) to the end of the 52-week RCT. Table 3 shows that the two treatment groups did not differ significantly on changes on any of the measures over the total 66-week period. Of note, lorcaserin-treated participants concluded the study with an overall estimated 0.9 point reduction on the PHQ-9, despite the small increase in scores during phase 2. When examining the main effect of time, statistically significant improvements were observed on the IWQOL-Lite total score and all five subscales, as well as on the PHQ-9. The Perceived Stress Scale was the only measure that did not change significantly over the 66 weeks.

Weight Loss as a Determinant of Changes in Weight-Specific HRQOL

Phase 1—Linear step-wise regression analyses, which included demographic variables and baseline BMI, showed that weight loss did not account for a significant amount of the variance in changes in the weight-specific HRQOL and psychosocial variables during phase 1.¹ For example, it accounted for only an additional 0.6% of the variance ($p = 0.38$) in the improvement in the IWQOL-Lite total score at week 14, with a total of 2.3% of the variance explained by all variables.

Phase 2—In contrast to phase 1, weight change from randomization to week 52 was significantly associated with changes in the IWQOL-Lite total score and three of the five subscales. Controlling for demographic variables, BMI, and treatment condition, weight loss accounted for an additional 15.5% of the variance in the change in IWQOL total score ($b = 0.76$, $SE = 0.18$, $p < 0.01$) and for 10–13% of the variance in changes in physical function ($b = 0.90$, $SE = 0.24$, $p < 0.01$), self-esteem ($b = 0.98$, $SE = 0.31$, $p < 0.01$), and work ($b = 0.68$,

¹Data available upon request.

$SE = 0.20$, $p < .001$). Weight loss in phase 2 was not significantly associated with changes in sexual life ($b = 0.60$, $SE = 0.33$, $p = 0.07$), public distress ($b = 0.29$, $SE = 0.23$, $p = 0.21$), depression ($b = -0.07$, $SE = 0.06$, $p = 0.26$), or perceived stress ($b = 0.04$, $SE = 0.12$, $p = 0.73$).

Phases 1 and 2 combined—Table 4 shows the regression results for the effects of weight loss on weight-specific HRQOL and psychosocial outcomes, as measured from the start of the 14-week LCD program (week -14) to week 52 of the RCT (i.e., 66 weeks in total), controlling for all covariates. Cumulative weight loss accounted for 9.1% of the variance in the change in the IWQOL-Lite total score at week 52 ($p < 0.01$). Among the subscales, the strongest association was between weight loss and improvements in physical function ($R^2 = 0.10$, $p < 0.01$). Weight loss was also associated with improvements in self-esteem ($R^2 = 0.05$, $p = 0.04$) and was marginally associated with improvements in sexual life ($R^2 = 0.04$, $p = 0.06$). Cumulative weight loss at week 52 was not associated with changes in public distress, work, depression, or perceived stress.

Categorical Weight Loss

Figure 1 displays the effects of losing <5%, 5–9.9%, and 10% weight on all weight-specific HRQOL outcomes, as measured from the start of the 14-week LCD program to the end of the 52-week RCT. Significant effects of categorical weight loss (e.g., 10%) were found for the IWQOL-Lite total score, as well as the physical function, self-esteem, and sexual life subscales. ANCOVA results showed that the main effect of categorical weight loss was significant for these four variables (p values ranged from 0.01 to 0.04, η_p^2 values ranged from 0.08 to 0.12). Pair-wise comparisons showed that for all four variables, weight losses of 10% were associated with significantly greater improvements in the weight-specific HRQOL scores than were losses <5% (p values < 0.05). Losses of 5–9.9% were associated with significantly greater improvements on the IWQOL-Lite total score than were losses of < 5% ($p = 0.04$). However, improvements in physical function, self-esteem, and sexual life were only marginally greater for losses of 5–9.9% than for those <5% ($0.05 < p$ values < 0.10). Losses of 10% of initial weight were not associated with significantly greater improvements on any of the four variables than were losses of 5.0–9.9%. No significant effects of categorical weight loss were found for the work and public distress subscales, PHQ-9 scores, or perceived stress.

Discussion

This study observed distinctly different changes in weight-specific HRQOL and related psychosocial outcomes during the weight loss and weight loss maintenance phases of the trial. During the initial 14-week LCD program that produced a mean loss of 9.3% of initial weight, participants achieved statistically significant improvements in total IWQOL-Lite scores, as well as the physical function, sexual life, self-esteem, and work subscales. Additionally, mean symptoms of depression, which were low to begin with (due to the exclusion of participants with major depressive disorder or on anti-depressants), declined significantly, though modestly. The present findings are consistent with prior reports of the

favorable effects of initial weight loss on multiple components of weight-specific HRQOL and related psychosocial outcomes (7,11,17).

Weight loss, however, was not linearly related to improvements in weight-specific HRQOL and psychosocial outcomes during the 14-week LCD program. It accounted, for example, for only 0.6% of the variance in the change in IWQOL-Lite total scores. The lack of a relationship is likely due to the requirement that all participants had to have lost at least 5% of initial weight to be randomized into the 52-week trial, which limited variability in the sample's weight losses.

In contrast to the improvements in weight-specific HRQOL during the initial weight loss phase, scores on these measures did not change appreciably during the 52-week RCT, during which weight increased, on average, by 2.0–2.5 kg. As reported previously (28), lorcaserin did not significantly improve weight loss at week 52, as compared with placebo, and we observed no differences between groups in the maintenance of improvements in weight-specific HRQOL scores achieved in the first 14 weeks. PHQ-9 depression scores increased significantly more in lorcaserin- than placebo-treated patients from randomization to week 52 (+2.2 vs. +0.1, respectively). However, mean scores for both groups were within normal limits at both times, and lorcaserin-treated participants completed the trial with a mean PHQ-9 score 0.9 points less than their value at the start of the 14-week LCD program.

Examining the treatment groups together, weight-specific HRQOL scores generally did not deteriorate during the 52-week RCT, despite the mean weight regain of 2.0–2.5 kg. Preservation of improvements may have been attributable to the relatively small amount of regain and to the social and cognitive support provided by the 16-session WLM intervention. We were surprised to find that public distress about one's weight, which did not change with weight loss during phase 1, improved significantly during phase 2 (with weight stability). Distress related to weight stigma may take more time to improve, due to the pervasiveness of such prejudice and some individuals' internalization of negative weight-based stereotypes (32,33). It also may have improved with the additional social, cognitive, and behavioral support provided by the WLM intervention.

Collapsing across treatment groups, all measures of weight-specific HRQOL and depressive symptoms (though not perceived stress) improved significantly from the start of the 14-week LCD program to the end of the 52-week RCT (i.e., 66 total weeks in total). The magnitude of improvement was greatest for physical function, and larger weight losses were associated with greater improvements in the total IWQOL-Lite score, as well as the physical function and self-esteem subscales. Additionally, losses of 10% or more of initial weight conferred significantly greater benefits than the loss of <5%. This clear effect of 10% weight loss on weight-specific HRQOL is consistent with prior findings suggesting that large magnitudes of weight loss are needed to substantially improve HRQOL (34). Further studies are needed to clarify the psychosocial effects of 5–9.9% weight loss.

Conclusion

Adults with obesity who achieved an average of 9.3% weight loss during a 14-week LCD program achieved improvements in several measures of weight-specific HRQOL,

particularly physical function, as assessed by the IWQOL-Lite. These improvements were generally maintained during a 52-week RCT which provided 16 group WLM sessions, combined with lorcaserin or placebo. Larger weight losses were associated with greater overall improvements in physical function, self-esteem, and total IWQOL-Lite scores, and we found evidence of particularly robust benefits with a loss of 10% of initial weight. Adjunctive interventions that target weight-related public distress, depression, and perceived stress may be needed to improve these aspects of psychosocial well-being in patients who report these or related problems.

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What is already known

- Weight loss is often, but not always, associated with improvements in health-related quality of life (HRQOL).
- Such improvements are typically greater for physical versus mental HRQOL.
- Weight regain is associated with deteriorations in HRQOL.

What this study adds

- Adults with obesity, who lost an average of 9.3% of initial weight in a 14-week intensive lifestyle intervention (with a low-calorie diet), reported significant improvements in weight-specific HRQOL and related psychosocial outcomes, with the greatest improvements in physical functioning.
- Improvements were sustained during a 52-week weight loss maintenance program that included behavioral and pharmacological treatment, despite mean weight regain of 2.0–2.5 kg.
- Long-term weight loss was linearly related to some but not all aspects of weight-specific HRQOL and psychosocial outcomes. A weight loss of 10% was associated with significant improvements in HRQOL.

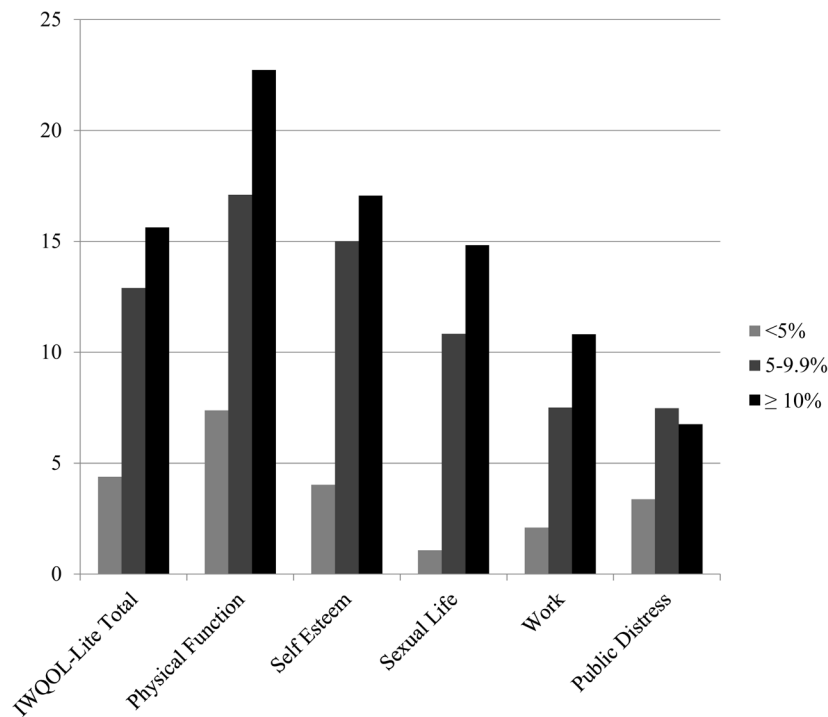


Figure 1.

Changes in IWQOL – Lite scores by percent weight loss

Note. Analyses of covariance showed significant differences for the IWQOL-Lite total score, as well as the physical function, self-esteem, and sexual life subscales, controlling for all covariates (p values < 0.04 ; p values > 0.05 for work and public distress subscales). Change scores were significantly smaller for participants who lost $< 5\%$ of their weight ($n = 32$) in comparison to those who lost $\geq 10\%$ ($n = 34$). IWQOL-Lite total change scores were significantly greater for patients who lost $5\text{--}9.9\%$ ($n = 23$) than for those who lost $< 5\%$ of their weight ($p = 0.04$). Scores did not differ between participants who lost 5% vs. 10% of their starting weight. IWQOL = Impact of Weight on Quality of Life.

Table 1

Weight-specific HRQOL and psychosocial characteristics at baseline and after the 14-week low-calorie diet program (i.e., randomization) for participants who qualified for randomization ($N = 137$).

Variable	Baseline	Randomization	Change from Baseline to Randomization	Statistical Comparison (p)
IWQOL – Lite				
Total Score	67.3 ± 19.1	76.6 ± 17.7	9.3 ± 14.4	< 0.001
Physical Function	63.8 ± 22.5	76.8 ± 18.0	13.0 ± 18.7	< 0.001
Self-Esteem	55.6 ± 26.3	65.8 ± 26.3	10.2 ± 19.4	< 0.001
Sexual Life	70.2 ± 29.2	79.4 ± 25.7	9.2 ± 22.7	< 0.001
Public Distress	77.9 ± 24.6	80.3 ± 24.3	2.4 ± 18.4	0.14
Work	80.3 ± 22.2	87.7 ± 18.4	7.4 ± 18.7	< 0.001
PHQ – 9	4.9 ± 5.0	2.5 ± 3.0	-2.5 ± 4.5	< 0.001
Perceived Stress Scale	20.6 ± 8.5	18.8 ± 7.8	-1.8 ± 6.8	0.004

Note. Values shown are the mean ± standard deviation. Due to missing data, N s ranged from 128–134. HRQOL=health-related quality of life; IWQOL=Impact of Weight on Quality of Life; PHQ-9=Patient Health Questionnaire-9.

Table 2

Participants' weight-specific HRQOL and psychosocial characteristics at the time of randomization to lorcaserin plus weight loss maintenance (WLM) counseling or placebo + WLM counseling ($N= 137$).

Variable	Lorcaserin + WLM (n = 69)	Placebo + WLM (n = 68)
IWQOL – Lite		
Total Score	75.9 ± 19.0	77.8 ± 16.1
Physical Function	75.9 ± 18.1	78.1 ± 17.8
Self-Esteem	67.4 ± 25.7	65.1 ± 26.9
Sexual Life	81.5 ± 25.0	78.4 ± 26.1
Public Distress ^a	75.9 ± 27.7	85.4 ± 18.9
Work	85.3 ± 22.1	90.3 ± 12.4
PHQ – 9	2.2 ± 3.2	2.7 ± 2.7
Perceived Stress Scale	19.2 ± 8.0	18.2 ± 8.0

Note. Values shown are the mean ± standard deviation. HRQOL=health-related quality of life; IWQOL= Impact of Weight on Quality of Life; PHQ-9= Patient Health Questionnaire – 9.

^aThere were no significant differences between treatment conditions, except on the Impact of Weight on Quality of Life Public Distress subscale.

Table 3

Changes in weight-specific HRQOL and psychosocial outcomes at week 52, as measured from randomization (week 0) and the start of the low-calorie diet program (week -14).

Variable	Lorcaserin + WLM	Placebo + WLM	Comparison Between Groups (<i>p</i>)	Change for Total Sample
<i>IWQOL – Lite Total</i>				
From week 0	+0.1±1.8	+3.6±2.0	0.18	+1.9±1.3
From week -14	+10.3±2.0	+11.6±2.3	0.68	+11.0±1.5 ^{***}
<i>IWQOL – Lite Physical Function</i>				
From week 0	-0.5±2.2	+5.6±2.5	0.08	+2.5±1.7
From week -14	+14.1±2.8	+18.1±3.2	0.36	+16.1±2.1 ^{***}
<i>IWQOL – Lite Self-Esteem</i>				
From week 0	-1.0±2.9	+4.2±3.2	0.23	+1.6±2.1
From week -14	+9.6±3.1	+14.9±3.5	0.26	+12.3±2.3 ^{***}
<i>IWQOL – Lite Sexual Life</i>				
From week 0	-1.6±3.0	+1.9±3.4	0.44	+0.1±2.2
From week -14	+8.6±2.9	+9.2±3.4	0.89	+8.9±2.2 ^{***}
<i>IWQOL – Lite Public Distress</i>				
From week 0	+4.5±2.0	+1.8±2.2	0.35	+3.1±1.5 [*]
From week -14	+4.7±2.8	+7.1±3.2	0.58	+5.9±2.1 ^{**}
<i>IWQOL – Lite Work</i>				
From week 0	-0.4±1.9	+0.3±2.2	0.81	<-0.1±1.4
From week -14	+10.2±2.7	+2.2±3.2	0.06	+6.2±2.1 ^{**}
<i>PHQ-9</i>				
From week 0	+2.2±0.5	+0.1±0.6	0.01	+1.1±0.4 ^{**}
From week -14	-0.9±0.7	-1.7±0.7	0.41	-1.3±0.5 [*]
<i>Perceived Stress Scale</i>				
From week 0	+1.5±1.0	+0.8±1.1	0.65	+1.1±0.8
From week -14	-0.7±1.2	-1.1±1.3	0.84	-0.9±0.9

Note. Values shown are estimated marginal means (for change scores) ± standard error of the completer population. Statistical significance of repeated measures analyses of variance for the total sample (testing for changes in scores over time) is indicated as follows:

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$.

Due to missing data, *n*s for the total sample ranged from 83 to 101. *N*s by condition ranged from 45 to 55 for lorcaserin, and 37 to 47 for placebo. HRQOL = health-related quality of life; IWQOL-Lite = Impact of Weight on Quality of Life; PHQ-9 = Patient Health Questionnaire – 9; WLM = weight loss maintenance.

Effects of weight loss on changes in weight-specific HRQOL and psychosocial outcomes from the start of the low-calorie diet program to week 52 (66 weeks total)

Table 4

Dependent Variable	Total R ^{2a}	R ² for Weight Loss	b	SE	β	p value
IWQOL-Lite						
Total Score	0.11	0.09	0.54	0.19	0.33	0.005
Physical Function	0.13	0.10	0.79	0.26	0.35	0.003
Self Esteem	0.08	0.05	0.60	0.28	0.24	0.037
Sexual Life	0.08	0.04	0.53	0.28	0.23	0.057
Public Distress	0.04	0.01	0.20	0.27	0.09	0.467
Work	0.11	0.02	0.37	0.26	0.16	0.159
PHQ-9	0.03	<0.01	0.04	0.06	0.07	0.555
Perceived Stress Scale	0.01	<0.001	0.01	0.11	0.01	0.925

Note.

^aRegression model included baseline age, race, gender, body mass index, treatment condition, and weight loss from baseline to week 52.

HRQOL = health-related quality of life; IWQOL = Impact of Weight on Quality of Life; PHQ-9 = Patient Health Questionnaire – 9.