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The Impact of a Primary Care-Based Weight Loss Intervention on Quality of Life

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Abstract

Objective—This study investigated changes in quality of life in men and women who participated in a primary care-based weight loss intervention.

Methods—Participants were enrolled in a two-year randomized clinical trial (POWER-UP) conducted at the University of Pennsylvania and six affiliated primary care practices. Inclusion criteria included the presence of obesity (body mass index of 30–50 kg/m²) and at least two components of the metabolic syndrome.

Main Outcome Measures—Quality of life was assessed by three measures: Short Form (12) Health Survey (SF-12); Impact of Weight on Quality of Life-Lite (IWQOL-Lite); and the EuroQol-5D.

Results—Six months after the onset of treatment, and with a mean weight loss of 3.9 ± .30 kg, participants reported significant improvements on all of the measures of interest with the exception of the Mental Component Score of the SF-12. These changes remained significantly improved from baseline at month 24, with the exception of the EuroQol-5D. Many of these

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Conflict of Interest

David Sarwer discloses that he has relationships with the following companies: Allergan, BaroNova, Enteromedics, Ethicon Endo-Surgery, and Galderma. The other authors declare no conflicts of interest. Thomas Wadden serves on the advisory boards of Novo Nordisk and Orexigen Therapeutics, which are developing weight loss medications, as well as of Alere and the Cardiometabolic Support Network, which provide behavioral weight loss programs.

improvements were correlated with the magnitude of weight loss and, for the most part, were consistent across gender and race.

Conclusion—Individuals with obesity and components of the metabolic syndrome reported significant improvements in most domains of quality of life with a modest weight loss of 3.7% of initial weight, achieved within the first 6 months of treatment. The majority of these improvements were maintained at month 24, when participants had lost 3.0% of their weight.

Keywords

quality of life; obesity; lifestyle modification; weight loss

Introduction

A large body of research has shown that obesity is associated with impairments in quality of life.^{1–4} More specifically, studies have suggested that both health and weight-related quality of life are impacted by excess body weight. Given the multidimensional nature of both forms of quality of life, weight-related comorbidities such as type 2 diabetes and hypertension, as well as the physical limitations imposed by excess body weight, have the potential to impact quality of life. A number of studies have identified a strong relationship between the degree of obesity and impairments in HRQOL.^{5–8} This relationship often is mediated by comorbid medical conditions.^{1, 8–11}

Numerous studies have suggested that individuals reported improvements in psychosocial functioning with weight loss.^{12–17} Perhaps the most consistent finding in this area is the association between weight loss and quality of life. This relationship may be strongest among individuals who lose larger amounts of weight.¹⁸ Health- and weight-related quality of life appear to improve in the vast majority of studies of persons who undergo bariatric surgery.¹⁹ For example, Sarwer *et al.* had 200 men and women undergoing bariatric surgery complete measures of quality of life and other psychosocial constructs both prior to surgery and again 20, 40, and 92 weeks postoperatively. Participants reported significant improvements in all domains of health- and weight-related quality of life within the first 20 weeks of surgery. These changes were well maintained during the first two postoperative years and were correlated with percent weight loss.

The present study was undertaken to investigate changes in quality of life in persons with obesity who presented for weight loss treatment and as part of a weight loss intervention being conducted in their primary care physicians' offices. We also investigated whether improvements in quality of life would be associated with the magnitude of weight loss and if participants from different demographic groups would experience different relationships between weight loss and improvements in quality of life.

Method

Study Design

This investigation used data from a 2-year randomized controlled trial titled, Practice-Based Opportunities for Weight Reduction at the University of Pennsylvania (POWER-UP). The design of the study²⁰ and major results²¹ have been published elsewhere. Participants were 390 obese men and women who also had at least two components of the metabolic syndrome. The questionnaires used in these analyses were collected during the participants' baseline visit, which took place between January 2008 and February 2009. Participants completed the measures again at months 6, 12, and 24. The trial was approved by the University of Pennsylvania Institutional Review Board, and informed consent was received from all participants.

Participants

Participants were recruited at six primary care practices owned by the University of Pennsylvania Health System. They had to be 21 yr of age or older, have a BMI of 30 to 50 kg/m², be established patients in the practice, and have at least two of five criteria for the metabolic syndrome: elevated waist circumference; elevated triglycerides; reduced HDL cholesterol; elevated blood pressure; and elevated fasting glucose.²²

Participants were randomized to one of three interventions of varying intensity, as detailed elsewhere.^{20–21} Individuals in the Usual Care condition received quarterly visits with their primary care provider, who provided education on weight management. Those in the Brief Lifestyle Counseling (LC) condition (i.e., Brief LC) also received quarterly visits with their PCP, in conjunction with brief, monthly sessions with lifestyle coaches who provided behavioral weight control counseling. Participants in the Enhanced Brief Lifestyle Counseling condition (i.e., Enhanced Brief LC) also attended quarterly visits with their PCP and received brief lifestyle counseling in combination with the use of meal replacements or weight loss medications (orlistat or sibutramine), selected in consultation with their PCP.

Measures

Short Form (12) Health Survey (SF-12)—The SF-12 is a 12-question version of the widely used 36-item Short-Form Health Survey. Items are divided into two subscales: physical health and mental health.²³ Lower scores indicate a lower health-related quality of life. Good evidence of reliability has been demonstrated between the SF-12 and the SF-36.

Impact of Weight on Quality of Life-Lite (IWQOL-Lite)—The IWQOL-Lite is a quality of life instrument specifically designed for use with persons who are overweight or obese.²⁴ It contains 31 items, with each item beginning with the phrase “Because of my weight.” The measure examines five domains: physical function; self-esteem; sexual life; public distress; and work. Responses to the 31 items are combined to calculate a total score that ranges from 0 to 100; higher scores indicate better quality of life.²⁵

EuroQol-5D—The EuroQol-5D contains a 5-question descriptive system that measures the following domains: mobility; self-care; usual activities; pain/discomfort; and anxiety/depression.²⁶ Each domain has three levels: 1 = no problems; 2 = some problems; and 3 = severe problems. The answers from each domain are combined to create an index score that ranges from –0.11 to 1.0. Lower EuroQol-5D index scores indicate lower health status.

Statistical Analysis Plan

All 390 participants completed the measures at baseline; 332 individuals returned the set of questionnaires at month 6, 305 at month 12, and 285 at month 24. We initially proposed to compare differences in quality of life between the three treatment groups. However, the only statistically significant differences were between the Enhanced Brief LC and Usual Care conditions on the Physical Function subscale of the IWQOL-Lite at month 6 ($p = 0.003$) and month 12 ($p = 0.004$) and for the Total Score for the IWQOL-Lite at month 6 ($p = 0.004$). For all three comparisons, participants in Enhanced Brief LC (who lost significantly more weight than those in Usual Care at all assessments) reported greater improvements in quality of life, as expected. Given the limited number of differences between the three treatment groups, we elected to focus our analytic plan on: changes over time across the three groups; the relationship between weight loss and quality of life; and differences in quality of life based on demographic variables of interest.

To assess changes over the three time points (months 6, 12, and 24) in the mean scores for the measures, as well as mean percent change in weight, repeated-measures analyses were

conducted using SAS Mixed procedure. An unstructured variance-covariance matrix was assumed for each outcome. Model based means (SE) are reported for each outcome at each time point. A significant main effect of time indicates significant changes in the outcomes across the 2 years. Using a Bonferroni adjustment for the pairwise time comparisons, these mixed model analyses also were used to identify significant within mean differences between time points for each outcome (Bonferroni adjusted $\alpha=0.008$). The relationships between the behavioral outcomes and gender and ethnicity were examined by adding these covariates to the mixed models. We also used correlation analyses to examine associations between percent weight loss and changes in quality of life. All analyses were conducted using SAS, version 9.2.

Results

Participants' Baseline Characteristics

Baseline characteristics of the 390 participants are shown in Table 1. The sample had a mean ($\pm$ SD) age of 51.5 ± 11.5 yr, weight of 107.7 ± 18.3 kg, and BMI of 38.5 ± 4.7 kg/m². Three hundred and eleven (79.7%) were women. Approximately 60% of participants were European-American, 38.5% were African-American, and the remainder of other ethnic origin. Approximately 75% reported some college coursework.

Changes in Weight

Based on the mixed model analysis that used all available data at each time point, mean body weight declined significantly over time ($p < .0001$). The 390 participants lost a mean ($\pm$ SE) of 3.9 ± 0.3 kg at month 6, 4.1 ± 0.4 kg at month 12, and 3.1 ± 0.4 kg at month 24. These losses corresponded to reductions in initial body weight of $3.7 \pm 0.3\%$, $4.0 \pm 0.4\%$, and $3.0 \pm 0.4\%$, respectively. (Changes in body weight, according to treatment condition have been reported previously.²¹)

Changes in Quality of Life

Table 2 displays the mixed model based means $\pm$ SE of the variables of interest at baseline and months 6, 12, and 24. At month 6, participants reported significant improvements on all domains of weight-related quality of life (IWQOL-Lite), as well as on the Physical Component Score of the SF-12 and the EuroQol-5D. There was no change at month 6 on the Mental Composite Score of the SF-12 or at any subsequent time. Most of these improvements remained significantly different from baseline at month 24 (all p 's < 0.008). The exception was the EuroQol-5D, which did not differ from baseline at months 12 or 24.

Correlation with Weight Loss

As shown in Table 3, percent weight loss was significantly correlated with a number of changes in quality of life at months 12 and 24. Larger weight losses were associated with significantly greater improvements on all of the IWQOL-Lite subscales with the exception of the Work subscale. On the SF-12, larger weight losses at month 12 were associated with significantly greater improvements on the Mental Composite Scale (MCS), but not on the Physical Component Scale (PCS). At month 24, the PCS was significantly associated with weight loss, whereas the MCS was not.

Gender, Ethnicity, and Quality of Life

Significant associations between weight change and changes in quality of life by gender and race were found more often in women than in men, and in whites than non-whites at both months 12 and 24. As shown in Table 4, significant associations in women were found at month 12 between weight loss and improvements on the IWQOL-Lite subscales that

measure Physical Function, Self-Esteem, and Sexual Life. Larger weight losses in women also were associated with greater improvement on the IWQOL-Lite total score, as well as on the MCS of the SF-12. At month 24, associations continued to be significant for Physical Function, Self Esteem, and the IWQOL-Total score but were not for the MCS. However, a significant association with the PCS of the SF-12 was observed.

At month 12, among men, significant associations between weight loss and quality of life were observed only on the Self-Esteem subscale, the IWQOL-Total score, and the EuroQOL5D Index. However, at month 24, significant associations were found between weight loss and changes on the Physical Function, Self Esteem, and Sexual Life subscales, as well as the IWQOL-Total score.

At month 12, among white participants, Table 5 shows significant correlations between weight loss and improvements in Physical Functioning, Self- Esteem, Sexual Life, and Public Distress, as well as the IWQOL-Lite total score. Among non-white participants, only Physical Functioning, Self-Esteem, and the IWQOL-Lite total scores were significantly correlated with weight loss at month 12. At month 24, weight loss was significantly associated in white participants with changes in Physical Functioning, Self Esteem, Sexual Life, Public Distress, the IWQOL-Lite total score, and the EuroQOL5D. In non-white participants, larger weight losses were significantly associated with changes in Physical Functioning, Self Esteem, and the IWQOL-Lite total score.

Discussion

Individuals with obesity and features of the metabolic syndrome reported significant improvements in several domains of quality of life within the first 6 months of a weight loss intervention undertaken in the offices of their primary care physicians. Almost all of these improvements were well maintained over two years. Most of these changes also were correlated with changes in weight.

The notable exception to this pattern of results was the absence of change on the Mental Composite Scale of the SF-12. The psychosocial burden of obesity is well documented and psychosocial distress, including impairments in quality of life, body image and sexuality, likely plays an important role in the decision to pursue weight loss.¹ It may be that the six items of the SF-12 that comprise the Mental Composite Scale are not specific enough to appropriately capture the psychological aspects of quality of life in persons with obesity and the metabolic syndrome.

Larger weight losses were associated with greater improvements in several domains of quality of life. These included the physical aspects of quality of life (as assessed by the Physical Composite Scale of the SF-12), the EuroQol-5, as well as all of the subscales of the IWQOL-Lite (with the exception of the Work subscale). This replicates recent results from our group but with individuals who had undergone bariatric surgery and lost much larger amounts of weight.¹⁹ In that study, improvements in quality of life also were experienced relatively early (by 20 weeks after surgery) and well maintained through the second postoperative year. As with previous research, the results of the present study suggest that even the more modest weight losses, obtained with non-surgical interventions, are associated with improvements in most areas of quality of life.^{13–18}

Greater weight loss was associated with greater self-reported improvements in multiple domains of quality of life. This was true for both women and men, although there were more statistically significant relationships for women than men. For both genders, the quality of life benefits of larger weight losses were seen at month 12, the assessment point at which participants had lost the greatest amount of weight. At month 24, larger weight losses

generally continued to be associated with greater improvements in quality of life, despite participants regaining an average of 1 kg from month 12 to month 24.

Both white and non-white participants had statistically significant correlations between percent weight loss and the subscales of the IWQOL-Lite. However, there were a greater number of statistically significant relationships for white than non-white participants, a finding that may be partially attributable to differences in sample size between the two groups. It may be that white individuals experience a wider range of weight-related quality of life benefits with greater weight loss, as compared to non-white individuals. However, it is important to note that non-white individuals also reported improvements in weight-related quality of life. Furthermore, the ultimate research and clinical implications of these observations are unknown.

In summary, results of this study add to the literature on the relationship between weight loss and improvements in quality of life. Numerous studies conducted in weight loss clinics have observed these relationships; we were able to replicate them in a clinical trial of obese individuals who received one of three interventions of differing intensities and delivered in primary care practices. Improvements in several domains of both health- and weight-related quality of life were observed when participants reached their maximum weight loss of 4.0%, suggesting that even relatively modest weight losses can have a significant impact.

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Table 1

Participants' baseline characteristics.

Variable	Total (N=390)	Usual Care (N=130)	Brief LC (N=131)	Enhanced Brief LC (N=129)
Age (yr)	51.5±11.5	51.7 ±12.1	52.0±12.2	51.0±10.1
Gender, N (%)				
Female	311 (79.7)	98(75.4)	110(84.0)	103(79.8)
Male	79 (20.3)	32(24.6)	21(16.0)	26(20.2)
Race, N (%)				
White	230(59.0)	81(62.3)	75(57.3)	74(57.4)
Black	150(38.5)	46(35.4)	52(39.7)	52(40.3)
Asian	4(1.0)	2(1.5)	0	2(1.6)
Multi-racial	6(1.5)	1(0.8)	4(3.1)	1(0.8)
Education, N (%)				
Less than high school	21(5.4)	10(7.7)	5(3.8)	6(4.7)
High school	78(20.0)	25(19.2)	27(20.6)	26(20.2)
Some college	141(36.2)	43(33.1)	50(38.2)	48(37.2)
College or greater	150 (38.5)	52 (40.0)	49 (37.4)	49 (38.0)
Body weight (kg)	107.7±18.3	111.2±20.0	106.3±17.3	105.4±17.2
Body mass index (kg/m ²)	38.5±4.7	39.0±4.8	38.5±4.6	37.8±4.7
SF-12				
PCS	43.6±9.7	43.4±9.5	43.9±9.0	43.5±10.6
MCS	49.3±9.9	48.7±10.5	48.9±9.8	50.3±9.4
IWQOL-Lite				
Physical Function	64.5±20.7	64.8±20.0	63.5±20.1	65.1±22.3
Self Esteem	57.5±26.9	56.3±25.6	56.9±28.3	59.4±26.8
Sexual Life	75.6±26.7	74.1±29.1	76.3±26.1	76.5±24.8
Public Distress	82.5±20.5	80.1±20.1	82.8±21.1	84.7±20.3
Work	83.4±20.0	82.6±20.6	84.6±19.1	83.1±20.3
QOL-Total	69.6±17.7	68.8±17.5	69.4±17.3	70.7±18.3
EuroQoL-5D				
Index Score	69.6±19.0	67.0±20.0	70.4±18.8	71.3±18.1

Note: Values shown for continuous variables are means ± SD; Brief LC = Brief Lifestyle Counseling; Enhanced Brief LC = Enhanced Brief Lifestyle Counseling; SF-12 = Short Form Health 12 Item Survey; IWQOL-Lite = Impact of Weight on Quality of Life-Lite; PCS = Physical Component Summary; MCS = Mental Component Summary

Table 2

Mean scores on quality of life measures at baseline and months 6, 12 and 24, collapsed across the three treatment interventions.

Variable	Baseline	Month 6	Month 12	Month 24
SF-12				
PCS	43.6±0.5 ^a	46.0±0.6 ^b	45.7±0.6 ^b	45.4±0.6 ^b
MCS	49.3±0.5 ^a	48.9±0.6 ^a	48.2±0.6 ^a	49.0±0.6 ^a
IWQOL-Lite				
Physical Function	64.5±1.1 ^a	72.6±1.0 ^b	74.1±1.0 ^b	73.2±1.1 ^b
Self Esteem	57.5±1.4 ^a	65.5±1.3 ^b	67.6±1.3 ^b	66.3±1.5 ^b
Sexual Life	75.6±1.4 ^a	81.0±1.3 ^b	81.1±1.4 ^b	80.2±1.5 ^b
Public Distress	82.5±1.0 ^a	86.1±1.0 ^b	86.1±1.0 ^b	87.0±1.0 ^b
Work	83.5±1.0 ^a	87.7±0.9 ^b	87.3±1.0 ^b	87.7±1.1 ^b
QOL-Total	69.7±0.9 ^a	76.0±0.9 ^b	77.0±0.9 ^b	76.4±1.0 ^b
EuroQol-5D				
Index	69.5±1.0 ^a	72.2±1.0 ^b	71.1±1.0 ^a	72.2±1.0 ^a

Note: Values shown are means (±SE). Examining across rows, for the same variable, values with different superscripts differ significantly from one another, using Bonferroni correction ($p < 0.008$). Thus, the mean 6-month PCS score of 46.0±0.6 was significantly different from the baseline score of 43.6±0.5, as shown by the different superscripts (b vs. a). Baseline and 6-month values for MCS were not significantly different, as shown by the shared superscript a. SF-12 = Short Form Health 12 Item Survey; IWQOL-Lite = Impact of Weight on Quality of Life-Lite; PCS = Physical Component Summary; MCS = Mental Component Summary.

Table 3

Correlations between weight change and psychosocial changes at months 12 and 24.

Subscales	r	P value
Month 12		
IWQOL-Lite		
Physical Function	−0.33	<.0001
Self-esteem	−0.36	<.0001
Sexual Life	−0.24	<.0001
Public Distress	−0.13	0.03
Work	−0.11	0.075
QOL-Total	−0.37	<.0001
EuroQol-5D		
Index Score	−0.14	0.014
SF-12		
PCS	−0.08	0.175
MCS	−0.14	0.017
Month 24		
IWQOL-Lite		
Physical Function	−0.35	<.0001
Self-esteem	−0.36	<.0001
Sexual Life	−0.18	0.008
Public Distress	−0.2	0.001
Work	−0.08	0.19
QOL-Total	−0.38	<.0001
EuroQol-5D		
Index Score	−0.12	0.042
SF-12		
PCS	−0.15	0.019
MCS	−0.03	0.664

Note: Negative correlations signify that greater improvements in quality of life (calculated as +) were associated with greater weight loss (calculated as −). IWQOL = Impact of Weight on Quality of Life-Lite; SF-12 = Short Form Health 12 Item Survey; PCS = Physical Component Summary; MCS = Mental Component Summary.

Table 4

Correlations between weight change and psychosocial changes by gender at months 12 and 24.

Subscales	Males		Females	
	r	P-value	r	P-value
Month 12				
IWQOL-Lite				
Physical Function	−0.18	0.072	−0.40	<.0001
Self-esteem	−0.42	0.0007	−0.37	<.0001
Sexual Life	−0.21	0.103	−0.27	0.0001
Public Distress	−0.13	0.301	−0.12	0.056
Work	−0.07	0.598	−0.13	0.048
QOL-Total	−0.3	0.018	−0.42	<.0001
EuroQOL-5D				
Index Score	−0.37	0.004	−0.08	0.23
SF-12				
PCS	−0.06	0.655	−0.09	0.176
MCS	−0.11	0.384	−0.15	0.022
Month 24				
IWQOL-Lite				
Physical Function	−0.34	0.01	−0.37	<.0001
Self-esteem	−0.43	0.001	−0.35	<.0001
Sexual Life	−0.3	0.027	−0.14	0.07
Public Distress	−0.21	0.121	−0.21	0.002
Work	−0.18	0.207	−0.08	0.276
QOL-Total	−0.42	0.001	−0.38	<.0001
EuroQol-5D				
Index Score	−0.25	0.067	−0.09	0.206
SF-12				
PCS	−0.09	0.514	−0.17	0.016
MCS	0.00	0.984	−0.05	0.487

Note: Negative correlations signify that greater improvements in quality of life (calculated as +) were associated with greater weight loss (calculated as −). IWQOL = Impact of Weight on Quality of Life-Lite; QOL-Total = quality of life – total; SF-12 = Short Form Health 12 Item Survey; PCS = Physical Component Summary; MCS = Mental Component Summary.

Table 5

Correlations between weight change and psychosocial changes by race at months 12 and 24.

Subscales	White		Non-White	
	r	P-value	r	P-value
Month 12				
IWQOL-Lite				
Physical Function	-0.34	<.0001	-0.34	0.0003
Self-esteem	-0.36	<.0001	-0.33	0.0003
Sexual Life	-0.28	0.0003	-0.17	0.108
Public Distress	-0.14	0.049	-0.06	0.512
Work	-0.12	0.095	-0.05	0.621
QOL-Total	-0.39	<.0001	-0.33	0.0004
EuroQol-5D				
Index Score	-0.13	0.067	-0.17	0.08
SF-12				
PCS	-0.12	0.099	0.00	0.999
MCS	-0.13	0.089	-0.16	0.103
Month 24				
IWQOL-Lite				
Physical Function	-0.36	<.0001	-0.30	0.003
Self-esteem	-0.36	<.0001	-0.29	0.004
Sexual Life	-0.26	0.002	0.00	0.993
Public Distress	-0.23	0.002	-0.13	0.22
Work	-0.13	0.095	0.06	0.574
QOL-Total	-0.41	<.0001	0.26	0.011
EuroQol-5D				
Index Score	-0.15	0.054	-0.09	0.39
SF-12				
PCS	-0.14	0.067	-0.16	0.129
MCS	0.001	0.985	-0.13	0.209

Note: Negative correlations signify that greater improvements in quality of life (calculated as +) were associated with greater weight loss (calculated as -). IWQOL = Impact of Weight on Quality of Life-Lite; QOL-Total = quality of life – total; SF-12 = Short Form Health 12 Item Survey; PCS = Physical Component Summary; MCS = Mental Component Summary.