Original Article

What extent of weight loss can benefit the health-related quality of life in motivated obese Chinese?

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Background: A clinical significant improvement in health-related quality of life (HRQOL) is one of the main goals of weight control. Objective: To reveal the extent of weight loss on changes of HRQOL in obese Chinese. Design: A total of 119 motivated obese adults (BMI: 33.5 ± 0.4 kg/m^2) completed a 6-month weight loss intervention program by following either low calorie diet suggestions (LCDS; n=18), LCDS plus sibutramine (SG; n=27), LCDS plus orlistat (OG; n=41), or very low calorie diet (VLCD; n=33). Changes in body composition (TBF-410GS, Tanita Co., Tokyo, Japan) and HRQOL (36-item Short-Form (SF-36) questionnaire) were measured accordingly. Results: After 6-months, the greatest weight loss (p<0.001) was found in VLCD group (14.1 ± 1.2 kg, 15.1%), followed by OG (10.6 ± 0.9 kg, 11.5%), SG (9.6 ± 1.3 kg, 10.2%) and LCDS alone (8.7 ± 1.2 kg, 11.1%). The physical component score of SF-36 were significantly improved at 6-month follow-up (p<0.001), but not the mental component score. Improvements in general health score of SF-36 (Δ mean: 6.1 ± 2.8, p<0.05) were greater in females than males. Subjects with weight loss ≥ 15 % had the greatest improvements in SF-36 scores whereas no changes in SF-36 scores were found with weight loss < 5%. Conclusions: The extent, not the type of intervention, of weight loss is highly correlated with the favorable changes in HRQOL at 6-months. Weight loss above 5% of baseline values is necessary to show significant improvements in HRQOL in motivated obese Chinese.

Key Words: very low calorie diet, sibutramine, orlistat, weight control, life quality

INTRODUCTION

Obesity, with its increasing prevalence, has become a global health problem in both developed and developing countries.[1,2] Obesity is a well-known risk factor in terms of the increased morbidity of cardiovascular disease, type 2 diabetes, hypertension, hyperlipidemia, cholelithiasis, osteoarthritis, postoperative complications, several forms of cancer, and psychological stress.[3,4] Many studies have also described the close link between obesity and health-related quality of life (HRQOL).[5] Obese people have been thought to have low quality of life, especially with regard to physical aspects of daily life,[6-10] while weight reduction might improve HRQOL. To what extent weight loss can significantly improve HRQOL remains unclear.

Although obesity is an important public health problem, the effectiveness of obesity treatment is often challenging and discouraging. Treatments of obesity including conventional hypocaloric diets, exercise interventions, behavioral modification, pharmacotherapy and bariatric surgery have produced varying effects in weight reduction. Orlistat, a gastrointestinal lipase inhibitor that reduces fat absorption, has been shown to reduce weight in many randomized control trials.[11,12] Sibutramine, a serotonin and norepinephrine reuptake inhibitor, produces weight loss by enhancing satiety and energy expenditure.[13,14] A very low calorie diet (VLCD) can be defined as a hypo-caloric diet containing 800 kcal/d or less, i.e. consumption of less than 12 kcal/kg of ideal body weight per day. A commercial VLCD package containing a large amount of protein (> 50 g/d) is now available for obesity treatment in the outpatient clinical settings.[15] Although these interventions have been shown to successfully reduce body weight in Caucasians,[11,16,17] available data showing treatment effects in the Chinese population are limited. Therefore, a study demonstrating the efficacy of these weight loss treatments in Chinese adults is warranted. Furthermore, the effects of different weight loss interventions on the changes of HRQOL in motivated obese Chinese have not been revealed in previous studies. As the prevalence of obesity and associated chronic diseases increase rapidly in Taiwan,[2] this study was designed to examine the effects of either the 6-month low calorie diet suggestion (LCDS) alone, LCDS plus orlistat, LCDS plus sibutramine, or VLCD on weight reduction and

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HRQOL in motivated obese Chinese. The interaction between the degree or magnitude of weight loss and HRQOL improvements were evaluated.

MATERIAL AND METHODS

Participants

From December 2001 to October 2005, a total of 446 individuals (32.1% male) visited the weight control clinic at National Cheng Kung University Medical Center in southern Taiwan. Subjects were instructed to follow a two-week weight and exercise program, participants with incomplete attendance records or no show will be classified as subjects with low motivation. After excluding the subjects with low motivation, combination therapy or shift therapy subjects, incomplete data and attritional subjects; forty-nine males and 70 females with body mass index (BMI) more than 25 kg/m^2 and aged 18-54 years who completed the 6-month treatment regimens were enrolled for analysis. All participants completed the HRQOL questionnaires and received basic physical examination at baseline and 6-month visits. Marital status, educational level (illiterate, primary school, high school, college, and graduate school) and occupational status (5-point scale) modified from the Edward's system was collected on each participant.[18] Social economical status (SES) was recorded as Modified Hollingshead's Index of Social Position and categorized into five classes (The Index of Social Position score = occupation scale score x factor weight + education scale score x factor weight).[18]

In 2001, The LCDS was the only approved 6-month weight loss intervention method in Taiwan. The orlistat, sibutramine and VLCD could be legally used since 2002, 2003 and 2004 subsequently in Taiwan. The availability and different content of the four interventions made blinded randomization impractical during clinical enrollment. Therefore, after the consent forms were obtained, the motivated obese subjects will receive either one of the four following weight loss intervention based-on the professional suggestion or their own choice for 6 months. The LCDS group was recommended to follow a balanced low calorie diet (500 Kcal deficits per day). In addition to the balanced diet, the sibutamine group (SG) was given sibutramine 10 mg or 15 mg daily and the orlistat group (OG) received 120mg orlistat t.i.d. In the VLCD group, two periods of calorie restriction regimens were arranged. In the first 3-month period of the VLCD, participants received a 450 or 800 kcal/day formulation diet (Modifast®:150 kcal/ sachet and 3 sachets/day or Optifast®:160 kcal/sachet and 5 sachets/day, Novartis). Participant will shift to normal balanced low calorie diet (~ 1200 kcal/day) progressively in the following 3-month re-feeding period. The scheduled bi-weekly to monthly visits for nutritional monitoring and exercise instruction were followed accordingly. All participants were encouraged to increase physical activity and frequency of exercise under the standard exercise instruction, such as exercising to achieve 60~70% of maximal heart rate, more than 30 mins per session and at least three sessions a week. Participants were also encouraged to keep records in their exercise diary, including type, duration and frequency, etc. These records will be evaluated during the bi-weekly visits for duration of 6 months.

Measures of anthropometrics

Body weight (to the nearest 0.1 kg) and height (to the nearest 0.1 cm) were measured in indoor clothing without shoes by the same staff using the same balanced scale for each visit. Body mass index was calculated by dividing weight in kilograms by square of height in meters. During fasting status and with an empty bladder, the percent body fat was measured using bioelectrical impedance analysis (TBF-410GS, Tanita Co., Tokyo, Japan).

Measures of HRQOL

The 36-item Short-Form (SF-36) Chinese Version was administered to assess participants' health-related quality of life.[19] The questionnaire consisted of eight multi-item dimensions. They were physical functioning (PF), limitations due to physical problems (Role-Physical), vitality (VT), bodily pain (BP), social functioning (SF), limitations due to emotional problems (Role-Emotional), mental health (MH), and general health (GH). The scores from these dimensions were further grouped into physical and mental components expressed as Physical Component Summary (PCS) and Mental Component Summary (MCS) score. The PCS score reflected physical morbidity and adaptation to disease, whereas the MCS score referred to mental morbidity and adaptation. The 8 dimensions scores of SF-36 are 0-100 scales, not standardized yet based on the Taiwanese population norm-based method.[20] The PCS and MCS were obtained by a normalized formula (mean = 50, standard deviation = 10) as described in the Manual. This Chinese version has been shown to have good construct validity and high internal reliability[20,21] with item-dimension correlation coefficients ranging from 0.40 to 0.83.[19] All dimensions have good item discriminate validity, except for the mental health dimension.[19] Internal reliability reached acceptable level for all dimensions (Cronbach's $\alpha > 0.70$), except for social functioning.[19]

Statistical analysis

Analyses were performed using SPSS for Windows, version 10.0 (SPSS, Inc., Chicago, IL). Data were presented as means ± standard error of mean (SEM) unless noted otherwise. The percent of weight change was calculated as (initial body weight – 6-month body weight) divided by initial body weight x 100%. Changes between the initial visit and the 6-month follow-up for weight, percent body fat and HRQOL were analyzed using the paired t test for each group or using the independent t test between the 4 groups. The different effects of 4 intervention programs between gender on changes of body composition and SF-36 scores were compared. Based on the magnitude of weight lost at 6-months, participants were categorized into 4 groups (less than 5%, between 5 % and 10 %, between 10% and 15%, and more than 15%). A comparison of treatment effects among groups were performed using ANCOVA followed by post hoc tests, when necessary. Statistical significance was defined as $p<0.05$ for two-tailed analysis.

RESULTS

Participant demographic data

Table 1 shows the characteristics of 119 participants, including forty-nine males (41.2%) and seventy females (58.8%). Of these participants, 52% were from a higher SES (≥3) with an evenly distributed marital status. No significant differences in basic characteristics, including age, sex, marital status and SES were found in the four groups. For all 119 participants, baseline body weight, BMI and percent body fat were 90.7 ± 1.7 kg (ranged from 55.7 to 145.7 kg), 33.5 ± 0.4 kg/m^2 (ranged from 25.1 to 46.6 kg/m^2) and 41.6 ± 0.7% (ranged from 25.4 to 65.1 %), respectively. As the low calorie diet was the basic weight loss intervention, the baseline BMI was relatively lower in the LCDS group (p=0.031), but the percent body fat was similar.

Effects of different programmed interventions

Compared with baseline values, body weight, BMI and percent body fat at 6-month markedly decreased in each group (table 2). Weight loss was 8.7 ± 1.2 kg (11.1%) in LCDS, 14.1 ± 1.2 kg (15.1%) in VLCD, 9.6 ± 1.3 kg (10.2%) in SG and 10.6 ± 0.9 kg (11.5%) in OG. Changes in weight and BMI were significantly greater in the VLCD group compared to the other three groups. Percent body fat decreased significantly in all group but there was no statistically significant differences between the four groups.

After adjustment for baseline BMI and sex, baseline SF-36 scores were not different between the groups. The scores for physical function, role-physical, bodily pain, general health, vitality, role-emotional and PCS improved significantly after 6-months of weight loss treatment in the combined group. Physical function improved in the LCDS group, while physical functioning, role-physical, bodily pain, general health, vitality, role-emotional and PCS score improved in the VLCD group. Bodily pain, general health and PCS score improved in the OG group. However, PCS, MCS scores, or total scores did not significantly change following the 6-month intervention in the SG group. There were no differences in HRQOL in the four groups as indicated by changes in the SF-36 scores, even after adjustment for age and sex.

Gender differences in HRQOL improvement

In table 3, body weight, percent body fat and BMI significantly reduced after 6-months treatment in both sexes. For males, the 6-month weight reduction intervention was associated with improvements in performance on the physical domain (physical functioning, role-physical, bodily pain, general health and PCS score). For females, improved physical functioning, bodily pain, general health, vitality, role-emotional and PCS appeared to be associated with weight reduction. After adjustment for age and changes (Δ) in BMI at 6-month, changes in general health score (Δ mean = 6.1 ± 2.8; p = 0.016) was

Table 1. Characteristics of study participants

Characteristics	Overall (n=119)	LCDS (n=18)	VLCD (n=33)	SG (n=27)	OG (n=41)	p value†
Sex (%)						
Males	41.2	22.2	36.4	42.0	48.8	0.303
Females	58.8	77.8	63.6	58.0	51.2	
Age (years)	35.2(1.0)	33.8(2.7)	36.6(1.8)	32.8(2.2)	36.2(1.5)	0.425
Height (cm)	163.7(0.9)	158.5(2.4)	163.6(1.5)	164.9(1.8)	165.2(1.4)	0.066
Body weight (kg)	90.7(1.7)	78.3(3.8)	93.6(3.0)	93.7(4.4)	91.7(2.7)	0.025
Body mass index (kg/m^2)	33.5(0.4)	30.9(0.8)	34.8(0.8)	34.0(1.1)	33.4(0.6)	0.031
Percent body fat (%)	41.6(0.7)	41.2(1.4)	43.1(1.5)	42.6(1.5)	40.0(1.2)	0.327
Marital status (%)						
Married or marriage-like relationship	44.2	33.3	48.5	33.3	52.4	0.290
Divorced/separated	5.8	5.6	6.1	7.4	4.8	
Never	50.0	61.1	45.5	59.3	42.9	
SES (%)						
1	1.7	0.0	0.0	3.7	2.3	0.427
2	46.3	44.4	57.6	48.1	37.2	
3	26.4	33.3	27.3	25.9	23.3	
4	24.8	22.2	15.2	18.5	37.2	
5 (highest level)	0.8	0.0	0.0	3.7	0.0	

Continuous variables are expressed as mean (SEM), SES: social economic status
LCDS: low caloric diet suggestion group, VLCD: very low calorie diet group, SG: siburamine group, OG: orlistat group.
†ANOVA, comparing continuous variables and comparing the categorical variables among the four groups.

Table 2. The 36-item Short-Form (SF-36) scores, body weight, BMI, body fat at baseline and the 6th month as well as their changes

Characteristics	Overall (n=119)			LCDS (n=18)			VLCD (n=33)			SG (n=27)			OG (n=41)			*p* value‡
	baseline	6th month	mean change	baseline	6th month	mean change	baseline	6th month	mean change	baseline	6th month	mean change	baseline	6th month	mean change	
Body weight (kg)	90.7(1.7)	79.6(1.5)	-11.1(0.6)***	78.3(3.8)	69.6(3.4)	-8.7(1.2)***	93.6(3.0)	79.5(2.5)	-14.1(1.2)***	93.7(4.4)	84.1(4.1)	-9.6(1.3)***	91.7(2.7)	81.1(2.3)	-10.6(0.9)***	0.001
BMI (kg/m^2)	33.5(0.4)	29.4(0.4)	-4.1(0.2)***	30.9(0.8)	27.4(0.6)	-3.5(0.5)***	34.8(0.8)	29.5(0.7)	-5.3(0.4)***	34.0(1.1)	30.5(1.0)	-3.5(0.4)***	33.4(0.7)	29.6(0.6)	-3.8(0.3)***	0.001
Percent body fat (%)	41.6(0.7)	34.4(0.7)	-7.2(0.5)***	41.2(1.4)	33.5(1.0)	-7.7(1.4)***	43.1(1.5)	35.3(1.5)	-7.8(0.7)***	42.6(1.5)	35.4(1.9)	-7.2(1.1)***	40.0(1.2)	33.5(1.3)	-6.5(0.9)***	0.650
SF-36 scores																
Physical Functioning	85.4(1.3)	91.4(0.9)	6.0(1.2)***	84.7(2.8)	91.4(2.0)	6.7(2.3)**	83.9(2.7)	93.9(1.1)	10.0(2.2)***	85.6(2.3)	88.7(2.7)	3.1(2.1)	86.9(2.5)	91.2(1.6)	4.3(2.5)	0.534
Role-Physical	76.3(3.2)	84.9(2.7)	8.6(3.5)*	77.8(8.1)	68.1(9.7)	-9.7(9.7)	77.3(5.1)	96.2(1.9)	18.9(4.9)***	79.6(6.3)	88.9(4.1)	9.3(7.0)	72.6(6.5)	80.5(5.2)	7.9(6.9)	0.110
Bodily Pain	64.4(2.2)	73.5(2.2)	9.1(2.6)**	64.1(5.9)	66.4(5.4)	2.3(5.9)	65.6(4.7)	79.9(3.9)	14.4(6.0)**	70.1(4.6)	72.6(4.5)	2.5(5.0)	59.8(3.4)	72.0(4.1)	12.2(3.8)**	0.421
General Health	59.6(1.4)	65.4(1.3)	5.8(1.4)***	60.3(3.7)	65.8(3.7)	5.5(2.8)	62.0(2.9)	68.5(2.1)	6.5(2.8)*	60.6(2.2)	63.0(3.0)	2.4(3.3)	56.8(2.4)	64.3(2.2)	7.5(2.3)**	0.515
Vitality	57.9(1.6)	63.5(1.7)	5.6(1.5)***	55.3(3.6)	57.5(4.1)	2.2(3.7)	60.9(3.4)	71.8(3.0)	10.9(2.4)***	58.0(3.0)	60.9(3.4)	2.9(3.6)	56.6(2.8)	61.2(2.9)	4.6(2.5)	0.245
Social Functioning	78.4(1.9)	81.6(1.7)	3.2(1.7)	77.1(2.9)	77.1(5.0)	0.0(5.4)	80.3(4.3)	86.7(2.8)	6.4(3.4)	75.0(3.9)	80.1(3.4)	5.1(4.1)	79.6(3.2)	80.5(3.1)	0.9(2.4)	0.479
Role-Emotional	65.0(3.8)	77.3(3.3)	12.3(3.9)**	57.4(11.0)	64.8(9.9)	7.4(11.9)	71.7(7.0)	91.9(4.4)	20.2(6.6)*	67.9(7.6)	72.8(7.1)	4.9(6.8)	61.0(6.7)	74.0(6.0)	13.0(7.2)	0.435
Mental Health	59.4(1.1)	59.0(1.0)	-0.4(0.9)	52.7(3.5)	57.1(2.6)	4.4(2.4)	60.6(2.0)	61.3(1.8)	0.7(1.8)	61.2(2.6)	58.1(2.2)	-3.1(2.2)	60.3(1.6)	58.5(1.9)	-1.8(1.4)	0.113
PCS score	42.1(1.0)	47.1(0.8)	5.0(1.0)***	44.4(2.1)	45.9(1.9)	1.5(2.4)	42.0(2.1)	49.8(1.1)	7.8(1.9)***	41.6(2.1)	45.3(2.4)	3.7(2.0)	41.6(1.7)	46.7(1.2)	5.1(1.8)**	0.374
MCS score	44.8(1.0)	45.3(1.0)	0.5(0.8)	41.6(2.7)	42.6(2.9)	1.0(2.2)	47.1(1.9)	48.8(1.4)	1.7(1.5)	45.6(2.2)	44.9(2.5)	-0.7(1.9)	43.8(1.9)	43.9(1.7)	0.1(1.5)	0.836

LCDS: low calorie diet suggestion group; VLCD: very low calorie diet group; SG: sibutramine group; OG: orlistat group; PCS score: physical component summary score; MCS score: mental component summary score.
Paired t-test, comparison of baseline and data at 6 months in each group, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
‡ANCOVA, adjusted for age and sex, comparison of the mean change among the four groups.

Table 3. Between gender comparisons of 36-item Short-Form scores at baseline and 6 months

Characteristics	males (n = 49)		*p* value†	females (n = 70)		*p* value†	*p* value§
	baseline	6th month		baseline	6th month		
Physical Functioning	86.8 (2.2)	93.7 (1.1)	0.002	84.5 (1.6)	89.9 (1.4)	0.001	0.999
Role-Physical	79.1 (4.3)	87.8 (3.6)	0.042	74.3 (4.5)	82.9 (3.8)	0.109	0.870
Bodily Pain	68.2 (3.6)	78.7 (3.4)	0.020	61.7 (2.8)	69.9 (2.9)	0.013	0.679
General Health	60.4 (2.4)	62.6 (2.1)	0.016	59.1 (1.7)	67.4 (1.6)	0.006	0.016
Vitality	58.3 (2.4)	63.5 (2.7)	0.333	57.6 (2.2)	63.5 (2.2)	0.000	0.744
Social Functioning	81.6 (2.5)	82.9 (2.8)	0.588	76.1 (2.7)	80.7 (2.2)	0.064	0.243
Role-Emotional	70.7 (5.8)	74.8 (5.5)	0.444	61.0 (5.1)	79.0 (4.1)	0.001	0.063
Mental Health	60.0 (1.8)	57.8 (1.6)	0.161	59.0 (1.4)	59.8 (1.4)	0.502	0.111
PCS score	41.1 (1.6)	47.8 (1.0)	0.000	42.8 (1.3)	46.6 (1.2)	0.006	0.280
MCS score	44.1 (1.8)	42.5 (1.7)	0.239	45.3 (1.2)	47.2 (1.2)	0.077	0.048
Body weight (kg)	105.5 (2.2)	91.6 (2.0)	0.000	80.2 (1.6)	71.2 (1.5)	0.000	0.000‡
BMI (kg/m^2)	35.4 (0.6)	30.7 (0.6)	0.000	32.2 (0.5)	28.6 (0.5)	0.000	0.000‡
Percent body fat (%)	37.5 (1.0)	29.8 (0.9)	0.000	44.5 (0.9)	37.7 (0.9)	0.000	0.000‡

PCS score: physical component summary score; MCS score: mental component summary score.
†Paired t-test: comparing the mean differences between the baseline and the 6th month by gender.
‡ Independent t-test, comparison of body composition change between genders.
§ANCOVA, adjusted for BMI changes and age, comparison of the SF-36 scores changes between genders.

Table 4. Comparisons of 36-item Short-Form scores at baseline and 6th month among different body weight loss groups

	weight loss ≥ 15% (n=31) △	*p* value†	10% ≤ weight loss < 15% (n=41) △	*p* value†	5% ≤ weight loss < 10% (n=38) △	*p* value†	weight loss < 5% (n=9) △	*p* value†	*p* value‡
Physical Functioning	8.5 (1.7)	0.000	9.3 (2.5)	0.001	2.0 (2.1)	0.339	-1.1 (3.5)	0.760	0.023
Role-Physical	11.3 (4.5)	0.017	11.0 (7.3)	0.138	1.3 (5.9)	0.824	19.4 (16.0)	0.259	0.527
Bodily Pain	3.9 (5.0)	0.440	11.9 (4.7)	0.016	12.8 (3.8)	0.002	-1.1 (12.4)	0.931	0.499
General Health	5.8 (2.5)	0.029	6.8 (2.7)	0.015	5.9 (1.9)	0.004	0.0 (7.4)	1.000	0.695
Vitality	5.6 (3.1)	0.083	7.1 (2.2)	0.003	4.5 (2.8)	0.113	3.9 (6.5)	0.569	0.750
Social Functioning	4.0 (3.2)	0.217	2.7 (3.6)	0.452	3.6 (2.4)	0.133	1.4 (7.3)	0.855	0.805
Role-Emotional	16.1 (6.2)	0.014	13.0 (6.3)	0.044	13.2 (7.5)	0.087	-7.4 (19.9)	0.719	0.216
Mental Health	-0.1 (1.8)	0.943	1.3 (1.5)	0.395	-2.5 (2.0)	0.209	-0.4 (2.4)	0.855	0.460
PCS score	4.9 (1.5)	0.002	6.6 (2.1)	0.003	3.8 (1.8)	0.037	2.7 (3.7)	0.487	0.636
MCS score	0.9 (1.4)	0.507	0.1 (1.5)	0.934	0.8 (1.5)	0.598	-0.7 (4.1)	0.867	0.577

△: the difference of scores between the baseline and the 6th month.
PCS score: physical component summary scores; MCS score: mental component summary scores.
†Paired t-test, compared the mean differences between the baseline and the 6th month in each group.
‡ANCOVA, adjusted for age and sex, compared the mean changes among groups with differing ranges of weight reduction.

much higher in females than males. A better improvement in MCS score (Δ mean = 3.5 ± 1.7, $p = 0.048$) was found in females than males.

Different levels of weight loss and HRQOL

In table 4, the physical domains, including PF, RP, BP and GH, significantly improved when weight loss was over 5 %. The greater the weight loss, the greater the improvements in SF-36 dimensions. When weight loss was >10%, the role-emotional scores improved significantly. However, no significant improvement in HRQOL could be found in the group with weight loss <5%.

DISCUSSION

Consistent with previous reports,[11-17] these four intervention programs resulted in significant reductions in body weight, BMI, and percent body fat with the VLCD treatment group achieving the greatest changes in body weight and BMI, followed by the two pharmacological treatments groups and the LCDS group. Some studies have suggested, at the same BMI cut-off points, the impact of obesity in Asians may be higher than that of other ethnic groups.[21,23] Moreover, the increased risks of medical problems associated with obesity were found to occur at a lower BMIs in Asians compared with Caucasians.[24,25] As obesity is becoming a threatening health and economic problem for the ethnically Chinese population in Taiwan,[2,21,22, 25,26] it is plausible to use the 6-month weight loss intervention in Taiwanese with a BMI of more than 25 Kg/m^2.[26,27]

Many reports showed that obesity has played a major role in determining HRQOL in Taiwan[21,25,28] and worldwide.[6-10] Obesity was mainly associated with the physical rather than the mental aspects of the HRQOL.[8,9,28] Increased body weight was associated with lower physical function, role physical, vitality, bodily pain, and general health scores.[10-16] It has been demonstrated that interventional weight loss improves the HRQOL.[29-31] Consistently, the programmed interventions that induced substantial weight reduction was accompanied with improved SF-36 scores in the dimensions of physical functioning, role-physical, bodily pain, general health, role-emotional and PCS in this study.[29-31] The fact that only substantial weight loss by the VLCD group showed significant improvement of role-emotional dimension implied that drastic weight loss was possibly needed for the changes of role-emotional dimension in HRQOL.

The SF-36 scores insignificantly changed in the SG group which is compatible with the previous finding that daily sibutramine treatment at 15 mg/day produced significant weight loss but unaltered SF-36 dimensions.[32] In contrast, a meta-analysis supports the positive changes of SF-36 scores after sibutramine intervention.[33] Whether the subjects of the SG group had relatively younger mean age (32.8 year), higher baseline SF-36 scores in most of the dimensions or smaller BMI changes that resulted in the inconsistent findings is worth of further investigation.

Many studies had demonstrated a substantial improvement of cardiovascular risk factors by 5% to 10% of weight loss.[34,35] We observed that our participants start to show a significant improvement of the SF-36 scores in various dimensions when a 5% to 10% of weight reduction was achieved at the 6-month follow-up. Among these, the role-emotional dimension improved when the percentage of weight loss reached 10%, which is relative lower than what was observed in Caucasians.[32] Since role-emotional was used to measure emotional problems associated with work or other daily activities, the special social context-dependent society in the Chinese culture could be more sensitive to this role-emotional dimension than in Western societies. Certainly, the fact that not all the dimensions of SF-36 could be improved by substantial weight loss suggests the complicated relationship between weight loss and HRQOL that warrant further study.

In our results, HRQOL stands to benefit from the weight loss more in women than in men, especially in the dimensions of general health and MCS. Obese women perceived markedly more psychosocial problems than obese men in Swedish obesity subjects (SOS) study.[36] It was also found that women thought their social relationships were influenced more by obesity than men.[37] Compared with men, is easier for a women to consider herself overweight and attempt to reduce weight interminably.[38,39] These gender differences of HRQOL are not uncommon[40,41] and could be attributable to different structural context (socioeconomic, age, social support, family arrangement), lifestyle exposure (smoking, drinking, exercise, diet) and psychosocial factors (critical life events, stress, psychological resources).[41] Therefore, it is possible to experience better improvement of HRQOL after substantial weight reduction in women.

There are several limitations in our study. First, it's possible that relatively small subjects numbers may have interpretational bias on weight loss, HRQOL and their interaction. To attenuate these biases, most confounders are considered and showed insignificant differences at baseline in the four groups. Motivated subjects could not be randomized, but the pattern of case distribution between the four groups could more closely reflect the situation in clinical practice. Despite the programmed method, our findings prove a convincible improvement in terms of HRQOL after 6-months of intervention and could be more applicative to daily practice. Secondly, obesity-specific questionnaires, such as obesity-specific health state preference (HSP),[43] obesity-related psychosocial problems scale (OP-scale)[36] and the Impact of Weight on Quality of Life (IWQOL),[44] are suppose to be more sensitive to revealing the case-specific perception of obese individuals. As there is no well-validated Chinese version of these obesity-specific questionnaires, the SF-36 questionnaire was acceptable to reflect general perception of obese this ethnicaly Chinese study population.[21,28] Thirdly, the NHANES suggested that a low HRQOL is inversely related to the level of physical activity in study participants.[45] We didn't measure the level of physical activity by any structured method, but assumed that by providing the general exercise instruction to all the participants, the exercise effect will evenly mitigate in our study groups. Nevertheless, the exercise effect on the changes of HRQOL can't be overlooked and should be interpreted carefully. Finally, the 6 month follow-up period may not sufficiently discriminate the interventional changes of body weight and HRQOL. Of the 446 visited individuals, only 119 (26.7%) satisfied the study criteria

of 6-months of intervention for analysis. It was possible that the high attrition rate of this study may also bias the final results. Although our findings were consistent with previous reports,[29-31] it would be worthwhile to conduct a large-scaled study to ascertain long-term effects.

In conclusion, the extent of weight loss, not the type of intervention, induced by the 6-month programmed interventions was consistently associated with the favorable changes of HRQOL in obese Chinese. Females' self-perceived general health seems to be more responsive to the weight loss than males'. Improvement of HRQOL was be significant when weight loss $\geqq$ 5% and more profound when weight loss $\geqq$ 15%.

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AUTHOR DISCLOSURES

The authors declare no conflict of interest

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Original Article

What extent of weight loss can benefit the health-related quality of life in motivated obese Chinese?

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有意減重的肥胖華人達到何種程度的體重減輕才有助於改善健康相關生活品質?

背景: 臨床上能顯著改善健康有關的生活品質(HRQOL)是體重控制的主要目標之一。目的:了解體重減輕程度對於肥胖華人 HRQOL 的改變。研究設計: 總計招募 119 位具有意願的肥胖成人(身體質量指數 33.5 ± 0.4 kg/m^2)並完成六個月的不同減重介入計劃包含：低熱量飲食建議組(LCDS，18 位)、LCDS 合併**諾美婷(**sibutramine)組(SG，27 位)、LCDS 合併**羅氏鮮(**orlistat)組(OG，41 位)或極低熱量飲食組(VLCD，33 位)。評估受試者身體組成變化與 HRQOL(短式 36 項問卷，SF-36)。結果: 經過六個月後，體重減輕最多為 VLCD 組(14.1 ± 1.2 kg, 15.1%, p<0.001)，其次為 OG 組(10.6 ± 0.9 kg, 11.5%)、SG 組(9.6 ± 1.3 kg, 10.2%)及 LCDS 組(8.7 ± 1.2 kg, 11.1%)。SF-36 之身體生理分數在六個月追蹤時明顯改善(p<0.001)，但是心理方面分數則不顯著。女性在整體健康分數的改善優於男性(Δ mean: 6.1 ± 2.8, p<0.05)。體重減輕≥15%者在 SF-36 量分的改善幅度最大，體重減輕<5%者則 SF-36 量分未見改變。結論: 減重程度而非減重方式與六個月的 HRQOL 改善具有高度的相關。對有意減重的肥胖華人，體重必須減輕 5%以上，才能呈現健康相關生活品質的進步。

關鍵字: 極低熱量飲食、諾美婷、羅氏鮮、體重控制、生活品質