Pilot Study of a 10-Week Multidisciplinary Tai Chi Intervention in Sedentary Obese Women

Arnaud Dechamps,†‡ Blandine Gatta, MD,† Isabelle Bourdel-Marchasson, MD, PhD,‡ Antoine Tabarin, MD, PhD,† and Patrick Roger, MD, PhD†*

Objective: Alternative approaches to weight control and physical activity are increasingly needed. Numerous factors influence weight management, including the choice of physical exercise. No study has previously examined the therapeutic effect of a multidisciplinary weight management program incorporating Tai Chi (TC) exercises among sedentary obese women.

Design: Randomized intervention trial with blinded medical provider.

Setting: In day hospital consultations.

Participants: Twenty-one obese women.

Intervention: All subjects participated in a 10-week weight management program that was part of usual care and included a hypocaloric balanced diet, a weekly physician/psychologist/dietician group session, and an exercise program. For the exercise component, subjects were randomized to either a 2-hour weekly session of TC or a conventional structured exercise program.

Main Outcome Measures: Changes in weight, body composition, heart rate, blood pressure, mobility scores, mood, Three Factor Eating Questionnaire scores, and General Self-Efficacy.

Results: The TC arm improved in resting systolic blood pressure, chair rise test, mood, and reduced percent of fat at week 10 and at 6 months follow-up. General self-efficacy was enhanced in both groups and maintained at 30 weeks.

Conclusion: The observed benefits over a 30-week period of a multidisciplinary weight management program incorporating TC exercises on physical functioning mood and dietary restraint need further understanding of how sedentary obese women adhere to physical activity like TC or other alternative exercises.

Key Words: Tai Chi, obese women, fat mass, mobility scores, mood, general self-efficacy

(*Clin J Sport Med* 2009;19:49–53)

INTRODUCTION

Obesity is a major health problem in industrialized countries. Although obesity is a chronic disorder of multifactorial etiology, sedentary lifestyle is assumed to be a key determinant in its development and maintenance.[1] Numerous studies have underlined the negative impact of a sedentary lifestyle on quality of life, depression, and anxiety, which are common features of obesity.[1] The promotion of light-to-moderate exercise for obese people has been shown to be associated with health benefits.[1,2] Tai Chi (TC) is a safe self-paced mild to moderate intensity type of exercise with origins in traditional Chinese martial and healing arts.[3] The reported benefits of TC exercises include reduced pain and anxiety[4] and improved self-efficacy, particularly in the elderly.[5] Cardiovascular benefits have also been shown for patients with chronic heart failure.[3] As a light-to-moderate exercise, TC has been used in physically deconditioned patients with various health conditions. While it may have some potential health benefits, no previous studies have explored the effects of TC exercises among obese subjects. The aim of our study was to compare the effects over 10 weeks of a multidisciplinary weight management program incorporating TC or a conventional structured exercise program for obese women on clinical and psychological variables. The authors hypothesized that TC exercise may be as efficient as a conventional structured exercise program in improving psychological and physical functioning.

MATERIALS AND METHODS

Subjects

Participation was proposed to 72 obese female outpatients during individual sessions. Obese subjects (defined as having a BMI $\geq$ 30 kg/m^2) were eligible to participate if they were sedentary women, defined as taking less than 20-min of planned exercise per week during the preceding 4-week period. Of the original pool, 51 patients were excluded for 1 or more of the following criteria: resting blood pressure (BP) $\geq$ 180/110 mmHg, if they were taking medications known to interfere with lipid metabolism, if they had any

Submitted for publication June 27, 2007; accepted October 23, 2008.

From the *Department of Physical Activity and Exercise Psychology, LACES 4140, Faculté des Sciences du Sport, Université Victor Segalen Bordeaux 2, Bordeaux, France; †CHU de Bordeaux, Department of Endocrinology; Université Victor Segalen Bordeaux 2, Bordeaux, France; and ‡CHU de Bordeaux, Department of Gerontology; UMR 5536 CNRS/Université Victor Segalen Bordeaux 2, Bordeaux, France.

This study was supported in part by grants CR T0115 R 034 11108 from the Conseil Régional d'Aquitaine, France, Laboratoire VSTII, LACES 4140, Faculté des Sciences du Sport, Université Victor Segalen Bordeaux 2.

The authors state that they have no financial interest in the products mentioned within this article.

Reprints: Arnaud Dechamps, Département de Gériatrie, Secrétariat du Professeur Bourdel-Marchasson, Hôpital Xavier-Arnozan, 33604 Pessac Cedex, France (e-mail: arnauddechamps@yahoo.co.uk).

musculoskeletal conditions or injuries or had previous experience of TC. Persons with bulimia nervosa, binge eating disorder, significant depression, or other psychiatric disturbances were excluded. The Institutional Review Board of the State Hospital Research University, Bordeaux, France, approved the study protocol. Twenty-one women (BMI, 38 ± 6 kg/m^2; mean age, 44.4 ± 11.9 years) gave their written informed consent.

All patients participated in a 10-week weight management program that was part of usual care and included a hypocaloric individualized balance diet monitored weekly by a dietician using food and exercise records, a weekly physician/psychologist/dietician group session, and an exercise program. For the exercise component, subjects were randomized to either a 2-hour weekly group session of TC or a conventional structured exercise program. Physician/psychologist/dietician and assessors were blinded to treatment group allocation. The intervention groups were randomly determined by a computer-generated random number to a 1:1 ratio of either a TC (n = 11) or a conventional structured exercise (E) program (n = 10). Blind allocation concealment was used to prevent previous knowledge of the upcoming assignments; the recruiter and the assigner were two different people (Figure 1). When inclusion criteria were met, one patient number at a time was instantaneously randomized by the assigner without any possibility of deciphering the assignment allocation scheme. The program was derived (frequency/duration of session) from the usual care practice of this setting. All sessions were held at the hospital facilities and consisted of a 2-hour group session once a week during the 10-week program. Participants in both groups were encouraged to engage in additional cardiovascular exercise (eg, walking). After the 10 weeks, subjects were asked to report on an exercise record in minutes any light-moderate-intense physical activity that they performed.

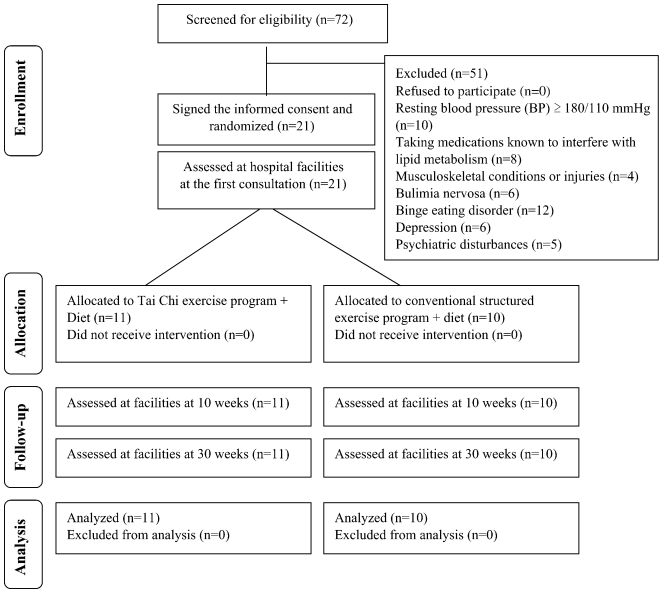

FIGURE 1. Flow of patients through the trial.

The TC classes were taught by an experienced instructor who followed an adapted variation of the Yang style, which emphasizes body sensation, awareness of multidirectional weight shifting, body alignment, and multisegmental movement coordination.[6] Breathing and conventional TC muscular reinforcement exercises were integrated in the TC routine. The instructor highlighted the TC theory of mind-body balance, which focuses on cognitive and behavioral strategies to strengthen willingness. The E sessions were taught by a physiotherapist and consisted predominantly of abdominal exercises, leg reinforcement, controlled breathing, and relaxation.

Physical and psychological measurements were performed at baseline, at the end of the 10-week program, and at week 30. Body weight and height were measured, and BMI was calculated. Body composition was assessed using air-displacement BOD POD (Life Measurement, Concord, California).[7] The patients' physical mobility scores were performed using the Timed Up-and-Go (TUG) test (time taken to rise from a chair, walk 10 feet, return, and sit down) and Chair Rise test (timed taken to rise 10 times from a chair). Self-efficacy was assessed using the General Self-Efficacy (GSE) scale, with higher scores indicating higher self-efficacy.[8] Norms and validity of the GSE can be found at http://www.ralfschwarzer.de/.

Mood was measured using the Beck Depression Inventory Short Form (BDI-SF),[9] with higher scores indicating a more depressive state. Cognitive restraint, disinhibition, and hunger were measured using the French version of the Three Eating Factor Questionnaire (TEFQ), with higher scores indicating more cognitive restraint, disinhibition, and hunger.[10,11]

Statistics

Values are expressed as means ± standard deviation. The results were analyzed using confidence limits around estimates at 95% for the change values. Aberrant data from exercise logs were not considered consistent for exercise activity estimations. This was a pilot study, so multiple comparisons were not accounted for.

RESULTS

There was no significant difference in the 2 groups at baseline (Table 1). All patients completed the 10-week program and 30-week follow-up. No adverse events occurred during the study period. At the end of the program, BMI did not differ between the 2 groups (Table 1). All patients complied with the caloric reduction portion. However, fat mass and percent of fat were lower in the TC group than in the E group. Resting systolic BP, resting heart rate, and time taken at the TUG and the Chair Rise test were reduced in the TC group at 10-weeks and were maintained at 30-week follow-up. GSE improved, and Beck scores decreased in the two groups, with a trend in favor of the TC group. At 10 weeks, dietary restraint was significantly reduced above the normal level in the TC group, whereas the E group had a slight increase.[10] During the follow-up period, no difference was observed between patients' reports of moderate intensity exercises (ie, mostly walking) per week in the TC group (mean 60 ± 65 min) and

TABLE 1. Changes in Clinical and Psychological Variables in the 2 Groups of Patients (Mean ± SD)

Variables/Groups	Baseline	Week 10	Change (SD) from Baseline [CI 95%]	Week 30	Change (SD) from Baseline [95% CI]	Difference From Baseline to 30 Weeks Between Groups (TC-E) [95% CI]
Weight (kg)						
Diet + TC	95.9 (14.7)	92.5 (15.9)	−3.4 (3.9) [−6.1 to −0.8]	93.7 (19.4)	−2.2 (8.3) [−7.8 to 3.3]	−1.8 [−8.5 to 4.9]
Diet + exercise	100.2 (19.2)	102.1 (21.4)	1.9 (10) [−5.2 to −9.1]	100.4 (22.2)	0.2 (9.6) [−6.7 to 7.2]	
BMI (kg/m^2)						
Diet + TC	37.4 (4.8)	36 (5.6)	−1.3 (1.5) [−2.3 to −0.3]	36.5 (6.8)	−0.9 (3.3) [−3.1 to 1.3]	−0.6 [−3.4 to 2.2]
Diet + exercise	38.5 (7.3)	39.3 (8.2)	0.7 (4) [−2.1 to 3.5]	38.5 (7.9)	−0.05 (3.9) [−2.8 to 2.7]	
Fat (kg)						
Diet + TC	46.6 (9)	42.6 (9.5)	−4 (3.5) [−6.4 to −1.7]	43.9 (13.2)	−2.7 (7.42) [−7.7 to 2.3]	−1.5 [−7.8 to 4.88]
Diet + exercise	49.7 (13.7)	51.5 (13.6)	1.8 (9.3) [−4.9 to 8.5]	48.8 (16.9)	−0.97 (8.5) [−7.1 to 5.1]	
Fat Free Mass (kg)						
Diet + TC	49.3 (7.7)	49.9 (8.8)	0.6 (2.8) [−1.3 to 2.5]	49.8 (9.9)	0.5 (3.8) [−2.1 to 3.1]	−0.3 [−5.1 to 4.4]
Diet + exercise	50.5 (7)	50.6 (9.2)	0.1 (5.2) [−3.5 to 3.8]	51.6 (9.6)	1.2 (4.7) [−2.1 to 4.6]	
Percent of fat (%)						
Diet + TC	48.5 (4.3)	45.6 (5.1)	−2.9 (2.4) [−4.4 to −1.2]	44.9 (7.2)	−3.6 (4.8) [−6.8 to −0.3]	−4.2 [−8.5 to 0.1]
Diet + exercise	50.3 (7)	48.1 (4.7)	−2.2 (5.4) [−6 to 1.7]	48.9 (8)	−1.4 (6.5) [−6.1 to 3.3]	
Resting SBP (mmHg)						
Diet + TC	147.3 (19.7)	124 (20.1)	−23.3 (20.4) [−37 to −9.6]	126.7 (15.6)	−20.6 (17.5) [−32.3 to −8.8]	−10.8 [−24.8 to 3.1]
Diet + exercise	141.6 (12.1)	137.6 (19.3)	−4 (20.4) [−18.7 to 10.5]	130.6 (12.1)	−11 (16.3) [−22.7 to 0.7]	
Resting DBP (mmHg)						
Diet + TC	82.9 (17.4)	72.1 (11.2)	−10.8 (12.3) [−19 to −2.4]	79.7 (14.3)	−3.2 (14.9) [13.2 to 6.8]	−2.3 [−14.5 to 9.8]
Diet + exercise	76.3 (12.7)	74.6 (11.7)	−1.6 (14.1) [−11.8 to 8.5]	72.3 (7.7)	−4 (14.2) [−14.2 to 6.2]	
Resting Heart Rate (BPM)						
Diet + TC	83.4 (17.3)	77.9 (12)	−5.5 (11.1) [−13 to 2]	77.3 (9.9)	−6.1 (20.9) [−20 to 2.8]	−12.5 [−28 to 3]
Diet + exercise	79.3 (11.6)	85.4 (17.3)	6.1 (12.8) [−3 to 15.3]	86.3 (11.4)	7 (9.9) [−0.05 to 14.1]	
Timed Up-and-Go (seconds)						
Diet + TC	7 (1.6)	5.8 (0.9)	−1.2 (0.9) [−1.8 to −0.6]	6.3 (0.9)	−0.7 (1.4) [−1.7 to 0.2]	−1.1 [−1.8 to −0.3]
Diet + exercise	7.1 (1.3)	6.4 (1.1)	−0.7 (0.9) [−1.3 to 0.04]	7.5 (0.5)	0.4 (1.2) [−0.4 to 1.3]	
Chair Rise test (seconds)						
Diet + TC	16.9 (3)	12.9 (1.9)	−4 (2) [−5.3 to −2.6]	13.6 (3.5)	−3.3 (3.8) [−5.9 to −0.7]	−3.6 [−5.9 to −1.3]
Diet + exercise	18.1 (5.5)	15.5 (3.1)	−2.6 (4) [−5.6 to 0.3]	18.4 (5.2)	0.29 (3) [−1.9 to 2.4]	
General Self-Efficacy (0–40)						
Diet + TC	27.6 (6.6)	35.4 (3.5)	7.8 (6.4) [3.5 to 12.1]	35 (2.4)	7.4 (5.7) [3.6 to 11.3]	5.6 [−1.1 to 12.3]
Diet + exercise	29.3 (5.7)	32.5 (6.4)	3.2 (3.7) [0.6 to 5.8]	31.3 (4)	2 (7.8) [−3.5 to 7.6]	
Beck Depression Inventory (0–39)						
Diet + TC	9.6 (7)	4.4 (4.2)	−5.2 (7.2) [−10.1 to −0.4]	1.8 (3)	−7.8 (7.3) [−12.8 to −2.9]	−2.1 [−9.4 to 5.1]
Diet + exercise	11 (7.4)	7.8 (7.3)	−3.2 (7) [−8.2 to 1.8]	4.7 (7.1)	−6.3 (7.3) [−11.5 to −1]	
Dietary restraint (0–21)						
Diet + TC	12.3 (3.2)	9.55 (3.9)	−2.8 (4) [−5.5 to −0.1]	14.2 (2.1)	1.9 (4.3) [−1.0 to 4.8]	−1.2 [−4.5 to 2.2]
Diet + exercise	11.3 (3.7)	13.4 (3.1)	2.1 (2.6) [0.3 to 4]	14.7 (2.9)	3.4 (3.6) [0.8 to 6.1]	
Disinhibition (0–16)						
Diet + TC	10.2 (2.9)	8 (2.6)	−2.2 (4) [−4.9 to 0.4]	8.3 (3.5)	−1.9 (4.2) [−4.9 to 0.4]	2.6 [−5.8 to 0.5]
Diet + exercise	8.5 (4.6)	9 (4.3)	0.5 (3.7) [−2.1 to 3.2]	8.5 (2.6)	−0.04 (3.5) [−2.6 to 2.4]	
Hunger (0–14)						
Diet + TC	4.7 (3.3)	4.1 (3.2)	−0.6 (3.1) [−2.7 to 1.5]	3.9 (2.1)	−1.2 (3.1) [−3.2 to 0.9]	0.1 [−3 to 3.2]
Diet + exercise	5.7 (3.9)	5.4 (3.7)	−0.3 (2.7) [−2.2 to 1.7]	3.9 (2.1)	−1.8 (2.7) [−3.7 to 0.1]	

All values are expressed as mean (SD). SDP, systolic blood pressure; DBP, diastolic blood pressure. No statistical difference was found in any of the baseline measures. The 95% Confidence Intervals (95% CI) are given for the change in values.

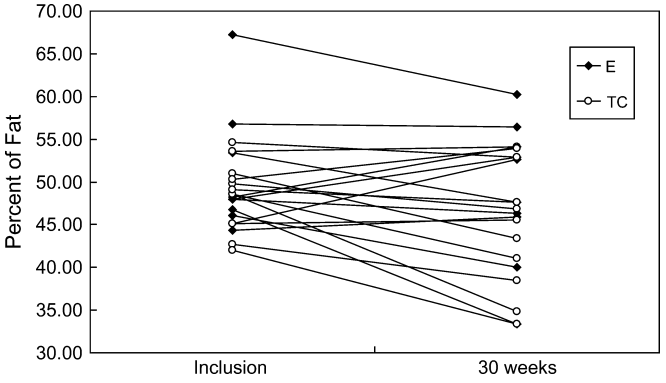

FIGURE 2. Individual trajectories in percent of fat change over the 30-week period.

the E group (60 ± 67 min). Individual and group change trajectories from baseline to 30 weeks for percent of fat and Chair Rise test time are presented in Figure 2, Figure 3, Figure 4 and Figure 5, respectively.

DISCUSSION

This pilot study is the first to report benefits from a multidisciplinary weight management program incorporating TC exercises compared with conventional structured exercises among obese women. The small sample size may have limited the reliability of the patients' declarative data concerning their food records, exercise log, and the weight loss interpretation. The potential lack of statistical power also limits the interpretation of the benefits of TC compared to conventional structured exercises. However, the psychological improvements seen in the TC arm in this study were probably clinically important.

TC exercises have been found to enhance adhesion to physical activity[5] and encourage people to engage in additional exercises.[1] This could potentially explain the weight loss difference in favor of TC, although no difference was found in the exercise log with the E group. The observed effects of the multidisciplinary TC program on physical functioning and mood in these obese patients confirms the moderate aerobic effect of TC.[3] The psychological improvements in

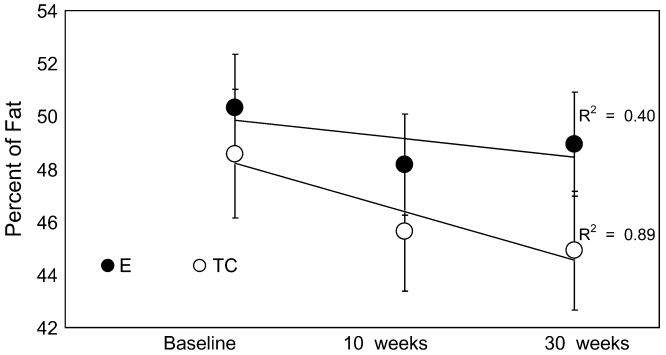

FIGURE 3. Mean change per group in percent of fat over the 30-week period.

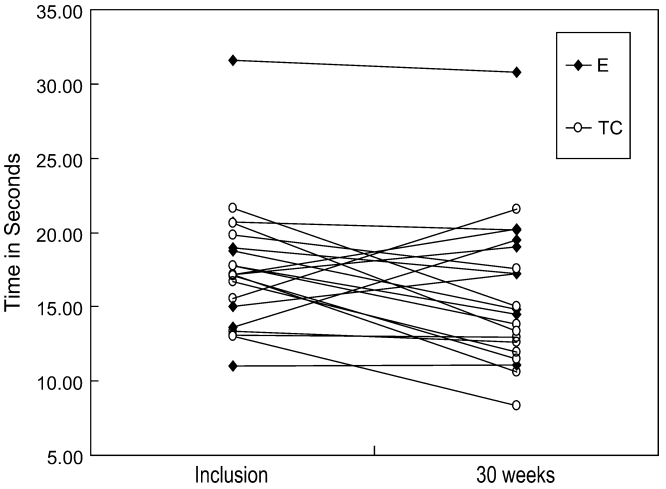

FIGURE 4. Individual trajectories at the Chair Rise test over the 30-week period.

both groups are consistent with our hypothesis and previous studies on lifestyle changes and mood enhancement using moderate intensity exercise with a lifestyle approach.[12,13] Adding guided enactive mastery and promoting self-confidence in a multidisciplinary program may be favorable to body composition changes and mood, may lead to normal cognitive restraint and disinhibition, and may enhance self-efficacy to overcome barriers to physical activity and negative self-beliefs.[8,14] The improvement noted in the 2 groups in GSE is noteworthy because it refers to successful coping and implies an internal stable attribution of success. Furthermore, it has been proved to be closely linked with patterns of physical activity and lifestyle changes in obese populations.[15]

In contrast to other forms of rehabilitation, TC encourages patients to move slowly and fluidly and to find rest in movement, which may be beneficial for physically deconditioned patients. Moreover, TC may be a response to patients' expectations and answer their need for new forms of therapy. We did not evaluate patients' expectations as a possible confounding variable; therefore, future investigations should explore this possible moderating effect.

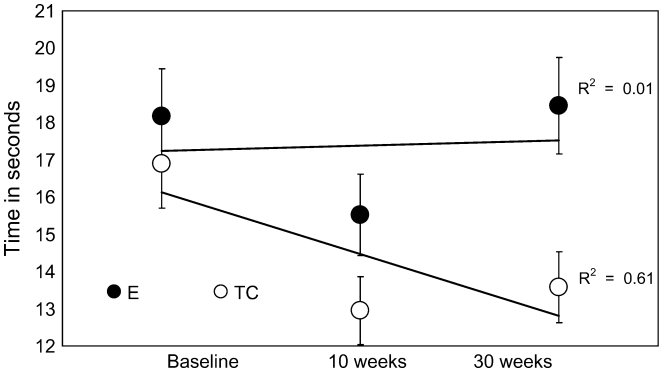

FIGURE 5. Mean change per group at the Chair Rise test over the 30-week period.

CONCLUSION

The observed benefits of TC exercises in a multidisciplinary weight management program conducted among obese women provide new insights into the relationships between physical therapy programs and patients' needs. Therefore, future studies should focus on how obese patients adhere to physical exercise programs.

REFERENCES

1. U.S. Department of Health & Human Services. The Surgeon General's call to action to prevent and decrease overweight and obesity. Rockville, MD: U.S. Department of Health & Human Services, Public Health Service, Office of the Surgeon General, 2001.
2. Yeh SH, Chuang H, Lin LW, et al. Regular Tai Chi Chuan exercise enhances functional mobility and CD4CD25 regulatory T cells. *Br J Sports Med*. 2006;40:239–243.
3. Yeh GY, Wood MJ, Lorell BH, et al. Effects of tai chi mind-body movement therapy on functional status and exercise capacity in patients with chronic heart failure: a randomized controlled trial. *Am J Med*. 2004; 117:541–548.
4. Ross MC, Bohannon AS, Davis DC, et al. The effects of a short-term exercise program on movement, pain, and mood in the elderly. Results of a pilot study. *J Holistic Nurs*. 1999;17:139–147.
5. Dechamps A, Lafont L, Bourdel-Marchasson I. Effects of Tai Chi exercises on self-efficacy and psychological health. *European Review of Aging and Physical Activity*. 2007;4:25–32.
6. Wolf SL, Barnhart HX, Ellison GL, et al. The effect of Tai Chi Quan and computerized balance training on postural stability in older subjects. Atlanta FICSIT Group. Frailty and Injuries: Cooperative Studies on Intervention Techniques. *Phys Ther*. 1997;77:371–381; discussion 382–374.
7. Fields DA, Goran MI, McCrory MA. Body-composition assessment via air-displacement plethysmography in adults and children: a review. *Am J Clin Nutr*. 2002;75:453–467.
8. Schwarzer R. *Self-Efficacy: Thought Control of Action*. Washington, DC: Hemisphere Publishing; 1992: 410.
9. Beck AT, Steer RA. *Manual for the Beck Depression Inventory*. New York, NY: Psychological Corp, 1987.
10. Stunkard AJ, Messick S. The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. *J Psychosom Res*. 1985;29: 71–83.
11. Karlsson J, Persson LO, Sjostrom L, et al. Psychometric properties and factor structure of the Three-Factor Eating Questionnaire (TFEQ) in obese men and women. Results from the Swedish Obese Subjects (SOS) study. *Int J Obes Relat Metab Disord*. 2000;24(12):1715–1725.
12. Andersen RE, Wadden TA, Bartlett SJ, et al. Effects of lifestyle activity vs structured aerobic exercise in obese women: a randomized trial. *JAMA*. 1999;281:335–340.
13. Hulens M, Vansant G, Claessens AL, et al. Health-related quality of life in physically active and sedentary obese women. *Am J Hum Biol*. 2002;14: 777–785.
14. Fossati M, Amati F, Painot D, et al. Cognitive-behavioral therapy with simultaneous nutritional and physical activity education in obese patients with binge eating disorder. *Eat Weight Disord*. 2004;9:134–138.
15. Teixeira PJ, Going SB, Houtkooper LB, et al. Pretreatment predictors of attrition and successful weight management in women. *Int J Obes Relat Metab Disord*. 2004;28:1124–1133.

