# The effect of exercise, cognitive therapy, and nutritional counseling in treating bulimia nervosa

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**ABSTRACT**

SUNDGOT-BORGEN, J., J. H. ROSENVINGE, R. BAHR, and L. SUNDGOT SCHNEIDER. The effect of exercise, cognitive therapy and nutritional counseling in treating bulimia nervosa. *Med. Sci. Sports Exerc.*, Vol. 34, No. 2, pp. 190–195, 2002. **Objective:** The aim of this treatment study on bulimia nervosa was (i) to examine the effect of physical exercise as an experimental treatment condition against the well-documented effect of cognitive-behavioral therapy (CBT), and (ii) to compare the effect of CBT versus the effect of nutritional advice as one single treatment component of CBT. **Method:** Normal weight female bulimic patients aged 18–29 yr were randomly assigned to a physical exercise program ($N = 15$), CBT ($N = 16$), nutritional advice ($N = 17$), or a waiting list control group ($N = 16$). Seventeen healthy female control subjects were also included. Treatment effects were determined by the frequency of binge eating and purging, scores on the Eating Disorder Inventory subscales "Drive for thinness," "Bulimia," and "Body dissatisfaction" and by a clinical interview to measure symptom severity. Assessments were made before and after treatment and at 6- and 18-month follow-up after the end of treatment. **Results:** Nutritional counseling did not prove more effective than CBT. Physical exercise appeared more effective than CBT in reducing pursuit of thinness; change in body composition; aerobic fitness; and frequency of bingeing, purging, and laxative abuse. **Conclusion:** Physical exercise is important in the treatment of normal weight bulimic patients. Further studies should address possible additive effects of CBT and physical exercise. **Key Words:** EATING DISORDERS, TREATMENT, ACTIVITY

Empirical research has shown that cognitive behavioral therapy (CBT) is the treatment of choice for bulimia nervosa (BN) (7,8,13,19,20). CBT aims to identify events and emotions preceding bulimic binges, and to modify underlying dysfunctional core beliefs. Also, by using behavioral techniques and nutritional counseling, one aims at improving chaotic eating behaviors and, hence, the risk for semistarvation or malnutrition. Hence, CBT contains two behavior control methods: 1) psychoeducation on sound and regular eating and eating patterns, 2) psychotherapy.

One line of research has focused on identifying whether CBT effects might be related to the package of approaches as a whole or to specific elements of CBT. For instance, several studies (1,2,12) have focused on the effects of CBT when adding antidepressants or behavior therapy approaches such as response prevention. However, the specific effects of nutritional counseling have not been evaluated in previous research.

Another line of research is to compare CBT with other treatment approaches. For instance, previous controlled studies (7,9) have reported on the proximal and distal effects of CBT versus behavioral therapy and interpersonal therapy. Another relevant comparison might, however, be between CBT and physical exercise (PE). Apart from being effective in the treatment of depression and anxiety disorders (18,23), physical exercise reduces overeating or bulimic binge eating in obese patients (16). Both aerobic and anaerobic exercise have been consistently related to improved self-esteem or self-concept (12). One may suggest that by improving physical fitness, normal weight bulimic patients may experience improved self-concept, less body dissatisfaction, and less binge eating, and thus a reduction of the uncomfortable internal sensations of bloating and distention during eating. To our knowledge, the effects of PE versus CBT have not, however, been investigated in previous studies with bulimic patients.

The first aim of this study was to compare the effects of CBT versus nutritional counseling alone. We suggest that this component of CBT would be less effective than the core CBT elements (cognitive restructuring and behavioral techniques) to accomplish reduced symptom load. The second aim of the study was to compare the effects of PE and CBT, suggesting that these approaches would produce equal symptom load reductions.

## METHODS

### Subjects

Following the written consent from the Regional Ethical Committee for Medical Research and from the Data Inspec-

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torate, physicians and psychologists in private practice and at psychiatric outpatient clinics in the Oslo area were invited by letter to refer eating-disordered patients to the study. Apart from satisfying the DSM-IV criteria for BN (3), patients were eligible according to the following conditions: no history of anorexia nervosa or other psychiatric or somatic disorders, no treatment for eating disorders for 6 months before entering the present study, no use of medication, and age between 18 and 29 yr. Initially, 77 patients were recruited. However, 10 were excluded for not meeting the inclusion criteria. In addition, three who met the criteria declined to take part, thus leaving 64 patients with bulimia nervosa to be entered.

Subjects in the healthy control group were recruited by an advertisement at the University of Oslo campus. In addition to not meeting the inclusion criteria for the treatment group, the inclusion criteria were eumenorrhea; regular participation in weight-bearing exercise (1–2 $h \cdot wk^{-1}$); no history of somatic or psychiatric disorders; no use of medication; and willingness to complete a dietary registration, a fitness test, a medical examination, and four clinical interviews. Twenty-four subjects signed up for the study. Eight subjects were excluded because of eating disorder symptoms ($N = 3$), menstrual irregularities ($N = 2$), vegetarian dietary habits ($N = 2$), and participation in competitive running ($N = 1$), thus leaving 16 healthy females to be entered. All participants who fulfilled the criteria were finally included after they had been informed about the content of the study and given their written, informed consent.

## Design

A random selection of the 64 patients allocated 16 to CBT, 15 to PE, 17 to nutritional advice, and 16 to the waiting list control condition. Two patients dropped out from the CBT group, three patients from the exercise group, and one from the waiting list control group. One patient moved out of the country, one felt that CBT would not help her, and one in the exercise group was injured. The reason for dropping out for two of those included in the exercise group and from the waiting list control group is not known. Thus, 59 subjects were included in the pretreatment and posttreatment evaluations and follow-up sessions at 6 and 18 months after the completion of the treatment program. In the posttreatment session, data were collected on weight history, menstruation, and physical activity. At every assessment point, self-report and testing data were collected on DSM-IV bulimic symptoms, nutritional habits, oxygen consumption, and percent body fat.

## Assessment

**Clinical interview.** The clinical interview consisted of a modified version of the semistructured Diagnostic Survey for Eating Disorders (15), which has been described elsewhere (24). To reduce bias, all clinical interviews were conducted by a researcher who was blind to the treatment groups.

**Body weight.** Body weight and height were recorded with subjects in their underwear and without shoes. Body mass index (BMI) was calculated according to the formula $kg/(m)^2$. Values above and below the range 19.0–23.9 indicate overweight and underweight, respectively. Fat mass (percent fat) was measured with dual-energy x-ray absorptiometry (DXA) (Lunar DPX-1, Lunar, Inc., Madison, WI).

**Physical activity and peak oxygen uptake.** Previous physical activity and present training volume were assessed by a self-report questionnaire followed by an interview to improve accuracy. The questionnaire contained information about the frequency and regularity of physical activity from the age of 12, in addition to the required physical education at school. As aerobic capacity was expected to vary widely, peak oxygen uptake was assessed using a walking test. A Balke protocol (14) was used with the following modifications: the participants warmed up for 10 min, and the incline of the treadmill was increased every minute, not every 2 min. The test was terminated when the participants were close to exhaustion according to the Borg scale (above 18), or when the oxygen uptake leveled off and the respiratory exchange ratio was above 1.05.

**Instruments.** The Eating Disorder Inventory (EDI) (11) was used to assess bulimic attitudes and behaviors using the subscales "Drive for thinness" (DT), "Bulimia" (B), and "Body dissatisfaction" (BD). Mean Chronbach's alpha value for all subscales was 0.82 (range, 0.74–0.90).

## Treatment

**Nutritional counseling.** The aim of the nutritional program was to educate patients to understand principles of good nutrition, nutritional needs, and the relationship between dieting and overeating. Meal planning was introduced to establish and maintain a pattern of regular eating. Treatment was given over 16 wk of outpatient sessions. In the first 2 wk, sessions were held twice a week followed by weekly sessions. Each session lasted 2 h and was conducted by a registered dietitian. The treatment was modified from the protocol developed by Hsu et al. (14) in terms of (i) group sessions including time to discuss food logs, and (ii) more frequent weight monitoring (i.e., every second week as compared with two times during the whole treatment program in the original protocol (14)). A deviation of more than 2 kg was discussed with respect to its reasons, and strategies for adherence to meal plans were suggested. In addition, subjects spent about 90 $min \cdot wk^{-1}$ of individual work to maintain their food logs.

**Cognitive behavioral therapy.** The aim of CBT was (a) to enable patients to identify thoughts, feelings, or events before or during bulimic episodes and thereby to discover how bingeing and purging may soothe or regulate emotions; (b) to enable patients to identify and modify core beliefs that perpetuate bulimic behavior; (c) to introduce behavioral techniques to combat urges to binge or vomit, and to develop alternatives to bulimic eating patterns to cope with disturbing thoughts and emotions; and (d) to provide training in general problem-solving skills. CBT sessions were

TABLE 1. Main demographic and clinical information for the subjects randomized to the conditions exercise, cognitive-behavioral therapy, nutrition, waiting-list, and control, respectively.

| | Exercise ($N$ = 12) | Cognitive ($N$ = 14) | Nutrition ($N$ = 17) | Waiting List ($N$ = 15) | Control ($N$ = 13) | $P$ Value |
|---|---|---|---|---|---|---|
| Age (yr) | 23 (2.3) | 22 (2.7) | 22 (2.9) | 23 (3.2) | 22 (4.1) | 0.34 |
| Duration of bulimia (yr) | 7 (3.7) | 5 (1.6) | 5 (2.3) | 6 (3.8) | — | |
| BMI ($kg \cdot m^{-2}$) | 21.0 (2.0) | 20.0 (1.9) | 21.0 (2.1) | 22.0 (2.5) | 21.0 (1.9) | 0.15 |
| Body fat (%) | 24.1 (8.3) | 23.4 (8.1) | 23.7 (8.9) | 21.6 (5.1) | 25.5 (7.0) | 0.75 |
| Training volume ($h \cdot wk^{-1}$) | 2.5 (3.8) | 2.1 (2.4) | 2.5 (2.2) | 3.1 (1.7) | 1.8 (1.3) | 0.72 |
| Peak $O_2$ uptake ($mL \cdot kg^{-1} \cdot min^{-1}$) | 43.5 (7.3) | 42.0 (6.0) | 44.1 (6.2) | 41.3 (12.2) | 43.1 (7.2) | 0.89 |

Values are given as means and SDs.

run by a therapist specially trained in CBT, and lasted 16 wk with one 2-h group session per week. Modifications (18) to the standard protocol (14) were that treatment was given as group sessions, and that logs and weight were monitored every second week. A deviation of more than 2 kg was discussed with respect to its reason, and strategies for adherence to their goals were suggested. In addition, subjects spent about 90 $min \cdot wk^{-1}$ with individual homework and logs.

**Physical exercise.** PE training consisted of moderate exercise with mixed aerobic and nonaerobic activities. Building on the concept "fitness for life," the aim of the treatment was to (a) promote physical fitness, (b) reduce feelings of fatness and sensation of bloating and distention associated with eating, (c) promote a more positive body image, and (d) prevent bingeing and purging.

A 2-h introduction meeting was arranged for the participants. In this meeting, participants were told the expected physical and psychological effects of regular physical activity. The treatment lasted for 16 wk with one 1-h group session per week run by a qualified fitness instructor. The fitness instructor had no training in CBT and was told not to discuss questions related to the patients' eating disorder. The aerobic activity level was calibrated to keep participants at 50–70% of their maximal oxygen consumption (45 min of jogging, cross-country skiing, or swimming) followed by a 15-min cool down and stretching. Heart rates was monitored (Polar Electro DY, Kempele, Finland) during the aerobic exercise. Within the treatment program, subjects were advised to exercise at least 35 min 2 $times \cdot wk^{-1}$ without the instructor being present.

## Statistical Analysis

Group differences were assessed by ANOVA for repeated measures (group × time) and by paired-sample $t$-tests and nonparametric tests. $P$ values $< 0.05$ were considered statistically significant.

## RESULTS

**Overall findings.** At pretreatment, no statistical differences between patients and controls were found with respect to age, body weight, BMI, tissue fat, or peak oxygen consumption (Table 1). There was a general effect of treatment (Wilks lambda = 0.04; $F = 5.67$; $P < 0.000$). Also, there was a significant group interaction (Wilks lambda = 0.00; $F = 4.95$; $P < 0.000$) and an effect of time (Wilks lambda = 0.01; $F = 26.07$; $P < 0.000$). The effects of covariates (age and duration of illness) did not reach statistical significance.

**Nutritional counseling versus CBT EDI findings.** On the DT subscale, improvement occurred in both conditions throughout. However, no significant group differences were found (Fig. 1).

On the B subscale, improvement occurred in both conditions (Fig. 2), but the CBT was superior to nutritional counseling at the first follow-up (mean CBT 2.64, SD 1.60; vs 5.00, SD 3.10, t = −2.57; $df = 29$; $P < 0.02$) and even more at the second follow-up (mean CBT 2.14, SD 1.83; vs 8.47, SD 2.15, t = −8.69; $df = 29$; $P < 0.000$).

On the BD subscale, pretreatment scores for the groups were almost equal (mean = 18.5), and while CBT was

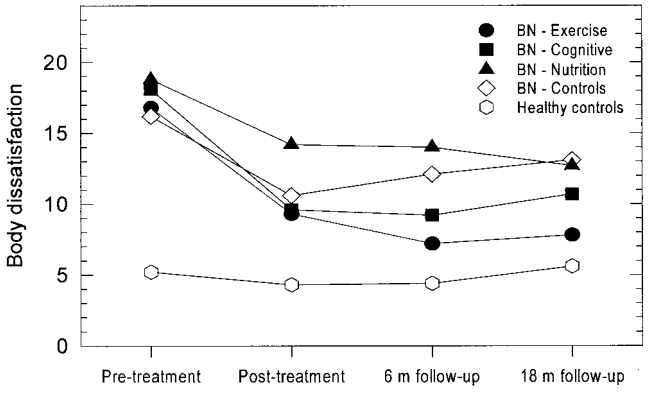


**FIGURE 1—Mean scores on the EDI "Drive for thinness" subscale for subjects randomized to the treatment conditions PE (*filled circles*), CBT (*filled squares*), nutrition (*filled triangles*), and patient controls and normal controls (*open symbols*) at pretreatment, posttreatment, and 6- and 18-month follow-up.**

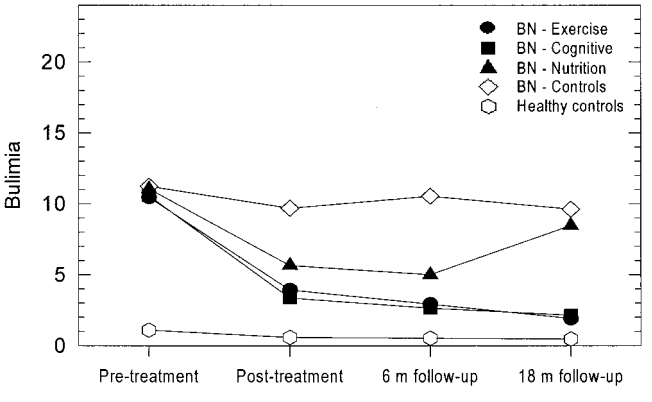


**FIGURE 2—Mean scores on the EDI "Bulimia" subscale for subjects randomized to the treatment conditions PE (*filled circles*), CBT (*filled squares*), nutrition (*filled triangles*), and patient controls and normal controls (*open symbols*) at pretreatment, posttreatment, and 6- and 18-month follow-up.**

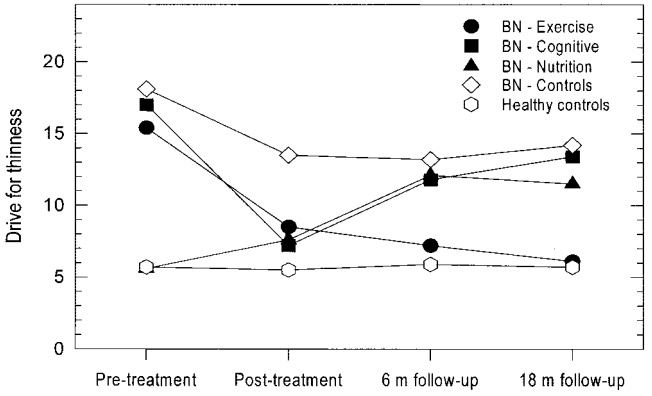


**FIGURE 3—Mean scores on the EDI "Body dissatisfaction" subscale for subjects randomized to the treatment conditions PE (*filled circles*), CBT (*filled squares*), nutrition (*filled triangles*), and patient controls and normal controls (*open symbols*) at pretreatment, posttreatment, and 6- and 18-month follow-up.**

superior at the posttreatment (mean CBT 9.64, SD 4.86; vs 14.24, SD 5.53, t = −2.43; $df = 29$; $P < 0.02$) and at the first follow-up (mean CBT 9.21, SD 3.02; vs 14.00, SD 5.32; $df = 29$; t = 2.99; $df = 29$; $P < 0.006$), the effect was lost at the 18 months follow-up (CBT 10.71, SD 3.45; nutrition 12.71, SD 5.58; $P$ = NS) (Fig. 3).

**Frequency of bulimic symptoms.** In contrast to the CBT group, the frequency of weekly binge eating, vomiting, and laxative abuse in the nutrition counseling group was rather unchanged throughout. The CBT reduction of vomiting was statistically different from the nutritional counseling group at the 6-month follow-up (mean CBT 3.50, SD 2.93; vs 7.06, SD 4.16, t = −2.69; $df = 29$; $P < 0.01$) and at the second follow-up (mean CBT 2.71, SD 1.94; vs 7.18, SD 4.05, t = −3.77; $df = 29$; $P < 0.001$) (Table 2).

**CBT versus PE EDI findings.** On the DT subscale, no statistical differences appeared between the CBT group and the exercise group at pretreatment and posttreatment sessions. However, the exercise group improved at the first follow-up (mean CBT 7.15, SD 2.41; vs 11.86, SD 4.33; t = −3.45; $df = 25$; $P < 0.02$) and at the second follow-up (mean CBT 6.08, SD 4.65; vs 13.43, SD 4.83; $df = 25$; $P < 0.000$) (Fig. 1). On the B and BD subscales, improvement occurred in both conditions throughout; however, no significant group differences were detected (Figs. 2 and 3).

**Frequency of bulimic symptoms.** In both groups, frequency of pretreatment weekly binges (mean CBT 7.9, SD 2.95; mean exercise 7.3, SD 2.72; $P$ = NS) was significantly reduced throughout (Table 2). At the final follow-up, however, the improvement for the exercise group was larger than for the CBT group (1.7, SD 2.87; vs CBT 4.36; SD 3.37; t = −2.21; $df = 25$; $P < 0.04$). With respect to weekly incidents of laxative abuse, the CBT group was rather unchanged (mean 2.30, SD 1.8) with a slight deterioration at the second follow-up (3.10, SD 2.40). At posttreatment, the CBT group reported more laxative abuse than the exercise group (mean CBT 2.1, SD 1.70; vs exercise 0.85, SD 0.99; t = −2.39; $df = 25$; $P < 0.02$). This pattern was sustained through the first follow-up (CBT 2.57, SD 2.10; vs exercise 0.00, SD 0.00; $df = 25$; $P < 0.000$) and the second follow-up (CBT 3.10, SD 2.40; vs exercise 0.08, SD 0.28; t = −4.46; $df = 25$; $P < 0.000$).

**Comparisons of healthy controls and the exercise group at the 18-month follow-up.** Independent *t*-test differences between healthy controls and the exercise group revealed significant differences ($P < 0.01$–$0.000$) on the EDI subscales except for the DT ($P = 0.08$) and BD ($P = 0.07$). On these three scales, the exercise group scored higher; however, statistical significance was not reached.

At pretreatment, no significant peak $\dot{V}O_2$ differences between groups were found (Table 1). In the PE group, an expected increase in peak oxygen consumption was found during the treatment program, and this was further increased at the follow-up examinations. Also expected, this pattern of change was unique to this treatment condition (Fig. 4). Furthermore, no significant difference between groups in percent body fat was observed at pretreatment (Table 1), but the exercise group decreased from 24.1 (SD 8.2) to 21.5 (SD 6.4) from pretest to posttest (t = 4.32; $df = 12$; $P < 0.001$). Similarly, a statistically significant decrease in fat mass from 21.5 (SD 6.4) at pretest to 19.8 (SD 4.89) at the 18-month follow-up was found (t = 2.39; $df = 12$; $P < 0.034$). Throughout the study, no significant decrease in fat mass was found for the other treatment conditions.

**DSM-IV eating disorders at 18-month follow-up.** Eight subjects in the exercise treatment group (62%) had recovered from BN, and one subject satisfied the criteria for eating disorder not otherwise specified (EDNOS) (3). Five subjects (36%) from the CBT group had recovered, two met the EDNOS criteria, and four subjects (24%) in the nutrition group met the EDNOS criteria.

## DISCUSSION

The first main finding was that on a long-term course, the effect of nutritional counseling appeared somewhat less than the effect of CBT. The other and perhaps more striking result was the superior effect of PE compared with CBT with respect to drive for thinness, bulimic symptoms, and body dissatisfaction. In fact, the EDI subscales show that the

TABLE 2. Means and SDs of weekly binge eating and vomiting at pretreatment and at 18-month follow-up.

| | Binge Eating | | | Vomiting | | |
|---|---|---|---|---|---|---|
| Condition | Pretest | 18-Month Follow-Up | *P* Value | Pretest | 18-Month Follow-Up | *P* Value |
| Exercise | 7.3 (2.72) | 1.7 (2.87) | 0.002 | 7.8 (3.39) | 2.4 (2.39) | 0.001 |
| Cognitive | 7.9 (2.95) | 4.4 (3.37) | 0.009 | 8.6 (4.68) | 2.7 (1.94) | 0.003 |
| Nutrition | 7.7 (3.76) | 6.8 (3.67) | NS | 8.2 (4.34) | 7.2 (4.05) | NS |
| Waiting list | 5.4 (2.63) | 4.5 (2.33) | NS | 5.6 (3.15) | 5.1 (2.47) | NS |
| *P* value | NS | 0.0002 | | NS | 0.000 | |

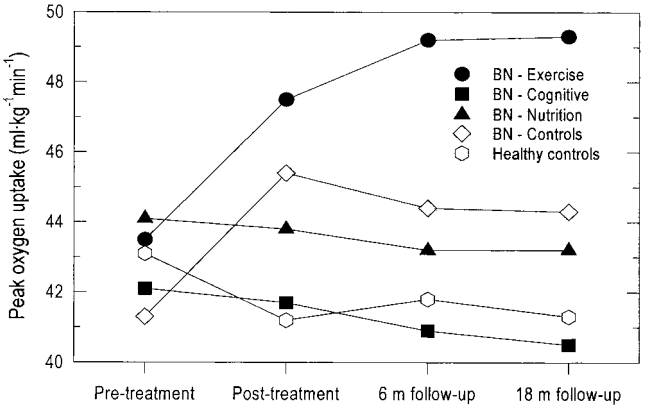


**FIGURE 4—Peak oxygen uptake ($mL \cdot kg^{-1} \cdot min^{-1}$) for subjects randomized to the treatment conditions PE (*filled circles*), CBT (*filled squares*), nutrition (*filled triangles*), and patient controls and normal controls (*open symbols*) at pretreatment, posttreatment, and 6- and 18-month follow-up.**

symptom load in the exercise group gradually decreased toward the level of healthy controls, whereas a deterioration of effect over time was found in the CBT group. Considering the actual standard deviations, and given alpha levels of at least 0.05 with between-group differences from 0.5–0.8, the statistical power would still be 40–70% for medium or large effect sizes, respectively. Hence, the validity of the results seems satisfactory despite the small sample size.

In general, physical activity may promote self-regulation (18). Hence, physical exercise may reduce bodily tensions and tolerance to everyday stress. This may be an important direct effect, for instance, explaining the effects of physical training in reducing clinical depression and anxiety (18). Considering the organizing element of self-regulation as well, the present study indicates that direct effects of physical training also take place among bulimic patients with respect to reducing dysfunctional impulsivity. Among healthy subjects, other kinds of direct training effects have been reported, such as a lower body weight, changes in the body composition, and improved appetite control and eating habits (5,6,10). This study is the first to indicate that similar and long-lasting effects may appear in patients with BN. Also, indirect effects of physical exercise may be considered. For instance, the experience of being able to follow a 16-wk group training program may in itself contribute to general well-being and to improved self-image (17), which in return could reduce bulimic symptoms (22). However, it is important to be aware of the possible risk of exercise being used as a "purge" method by some patients, and also the cognitive distinction often seen where the patient feels that she deserves to eat or does not feel fat because she exercised that day.

At least with respect to possible direct effects outlined above, the present study results may depend on a certain training intensity to accomplish an increased fitness level and a reduction in body fat. Future research may explore this hypothesis by manipulating the training intensity. With respect to the possible indirect effect, future studies may compare the effects of the present exercise program versus physical exercise including more fun and creative variations with respect to physical activity within more individualized programs.

The clinical implications of this study may be that an exercise program could very well be included in the treatment of BN and that nutritional counseling may be an optional, but not a necessary, part of CBT. Furthermore, our results may suggest additive effect of CBT and physical activity, a hypothesis that also warrants a controlled treatment study (4,21).

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## REFERENCES

1. AGRAS, W. S., J. A. SCHNEIDER, B. ARNOW, S. D. RAEBURN, and C. F. TELCH. Cognitive-behavioral and response-prevention treatment for bulimia nervosa. *J. Consult Clin. Psychol.* 57:215–221, 1989.
2. AGRAS, W. S., E. M. ROSSITER, B. ARNOW, et al. Pharmacological and cognitive-behavioral treatment for bulimia nervosa: a controlled comparison. *Am. J. Psychiatry* 149:82–87, 1992.
3. AMERICAN PSYCHIATRIC ASSOCIATION. *Diagnostic and Statistical Manual of Mental Disorders*. Washington, DC: American Psychiatric Association, 1994, pp. 251–254.
4. BALKE B. Optimale Körperliche Leistungsfähigkeit, ihre Messung und Veränderung infolge Arbeitsermüdung. *Arbeidsphysiologie* 15:311–323, 1954.
5. BLUMENTHAL, J. A., R. S. WILLIAMS, T. L. NEEDELS, and A. G. WALLACE. Psychological changes accompany aerobic exercise in healthy middle-aged adults. *Psychosom. Med.* 44:529–536, 1982.
6. ELRICK, H. Exercise is medicine. *Phys. Sportsmed.* 24:72–78, 1996.
7. FAIRBURN, C. G., R. JONES, R. C. PEVELER, et al. Three psychological treatments for bulimia nervosa. *Arch. Gen. Psychiatry* 48: 463–469, 1991.
8. FAIRBURN, C. G., R. JONES, R. C. PEVELER, R. A. HOPE, and M. O'CONNOR. Psychotherapy and bulimia nervosa: longer term effects of interpersonal therapy, behavior therapy and cognitive behavioral therapy. *Arch. Gen. Psychiatry* 50:419–428, 1993.
9. FAIRBURN, C. G., P. A. NORMAN, S. WELCH, M. O'CONNOR, H. DOLL, and R. C. PEVELER. A prospective study of outcome in bulimia nervosa and the long term effects of three psychological treatments. *Arch. Gen. Psychiatry* 52:304–312, 1995.
10. FOLKINS, C. H., and W. E. SIME. Physical fitness training and mental health. *Am. Psychol.* 36:373–389, 1981.
11. GARNER, D. M., M. P. OLMSTED, and J. POLIVY. The eating Disorders Inventory: a measure of cognitive-behavioral dimensions of anorexia nervosa and bulimia. In: *Anorexia Nervosa: Recent Developments in Research*, P. L. Darby, et al. (Eds.). New York: Alan R. Liss, 1983, pp. 173–184.
12. GARNER, D. M., W. ROCKERT, R. DAVIS, M. V. GARNER, M. P. OLMSTED, and M. EAGLE. Comparison of cognitive-behavioural and supportive-expressive therapy for bulimia nervosa. *Am. J. Psychiatry* 150:37–46, 1993.
13. HSU, L. K. G., R. SANTHOUSE, and B. E. CHESLER. Individual cognitive behavioral therapy for bulimia nervosa: the description of a program. *Int. J. Eat. Disord.* 3:273–283, 1991.
14. HSU, L. K. G., B. HOLBEN, and S. WEST. Nutritional counseling in bulimia nervosa. *Int. J. Eat. Disord.* 11:55–62, 1992.

15. JOHNSON, C. Initial consultation for patients with bulimia nervosa and anorexia nervosa. In: *Handbook of Psychotherapy for Anorexia Nervosa and Bulimia Nervosa*, D. M. Garner, P. E. Garfinkel (Eds.). New York: The Guildford Press, 1985, pp. 19–54.
16. LEVINE, M. D., M. D. MARCUS, and P. MOULTON. Exercise in the treatment of binge eating disorder. *Int. J. Eat. Disord.* 19:171–177, 1996.
17. LOWEN, A. *Pleasure: A Creative Approach to Life*. New York: Coward-McCann, 1970, p. 10.
18. MARTINSEN, E. W. Benefits of exercise for the treatment of depression. *Sports Med.* 9:380–389, 1990.
19. MITCHELL, J., R. L. PYLE, C. POMERY, M. ZOLLMAN, R. CROSBY, and E. D. ECKERT. Cognitive-behavioral group psychotherapy of bulimia nervosa: importance of logistical variables. *Int. J. Eat. Disord.* 14:277–287, 1993.
20. MITCHELL, J., H. N. HOBERMAN, C. B. PETERSON, M. MUSSEL, and R. L. PYLE. Research on the psychotherapy of bulimia nervosa: half empty or half full. *Int. J. Eat. Disord.* 20:219–228, 1995.
21. NIEMANN, D. C. *Stress Management in The Exercise-Health Connection*. Champaign, IL: Human Kinetics, 1998, pp. 245–262.
22. SILVERA, D. H., T. D. BERGERSEN, L. BJØRGUM, J. A. PERRY, J. H. ROSENVINGE, and A. HOLTE. Analyzing the relation between self-esteem and eating disorders: differential effects of self-liking and self-competence. *Eat. Weight Disord.* 3:95–99, 1998.
23. STEWART, N. J., L. M. MCMULLEN, and L. D. RUBIN. Movement therapy with depressed inpatients: a randomized multiple single case design. *Arch. Psychiatr. Nurs.* 8:22–29, 1994.
24. SUNDGOT-BORGEN, J. Prevalence of eating disorders in elite female athletes. *Int. J. Sport Nutr.* 3:29–40, 1993.