# Prevention of Progression to Severe Obesity in a Group of Obese Schoolchildren Treated With Family Therapy

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ABSTRACT. *Study objective.* **To evaluate the effect of family therapy on childhood obesity.**

*Design.* **Clinical trial. One year follow-up.**

*Setting.* **Referral from school after screening.**

*Participants.* **Of 1774 children (aged 10 to 11), screened for obesity, 44 obese children were divided into two treatment groups. In an untreated control group of 50 obese children, screened in the same manner, body mass index (BMI) values were recorded twice, at 10 to 11 and at 14 years of age.**

*Intervention.* **Both treatment groups received comparable dietary counseling and medical checkups for a period of 14 to 18 months, while one of the groups also received family therapy.**

*Results.* **At the 1-year follow-up, when the children were 14 years of age, intention-to-treat analyses were made of the weight and height data for 39 of 44 children in the two treatment groups and for 48 of the 50 control children. The increase of BMI in the family therapy group was less than in the conventional treatment group at the end of treatment, and less than in the control group ($P = .04$ and $P = .02$, respectively). Moreover, mean BMI was significantly lower in the family therapy group than in the control group ($P < .05$), and the family therapy group also had fewer children with BMI > 30 than the control group ($P = .02$). The reduction of triceps, subscapular, and suprailiac skinfold thicknesses, expressed as percentages of the initial values, was significantly greater in the family therapy group than in the conventional treatment group ($P = .03$, $P = .005$ and $P = .002$, respectively), and their physical fitness was significantly better ($P < .05$).**

*Conclusions.* **Family therapy seems to be effective in preventing progression to severe obesity during adolescence if the treatment starts at 10 to 11 years of age.** *Pediatrics* **1993;91:880–884;** ***obesity, family therapy.***

ABBREVIATION. BMI, body mass index.

Approaches to the treatment of obesity are greatly influenced by beliefs about the etiology of the disease. Many behavioral programs have been based on the belief that obesity is a "learned disease" that is possible to cure by "relearning" as shown by Stuart.[1] Adult obesity would seem to be highly dependent on genetic factors.[2] Ideal behavioral programs with successful long-term results have been difficult to obtain, as reviewed by Brownell and Wadden.[3]

Behavioral treatment is focused on the process of behavioral change and on giving direct advice to patients and their parents. Group dynamics is not usually taken into account.[3] Six general aspects are involved: self-monitoring, stimulus control, reducing the rate of eating, nutrition education, cognitive restructuring, and increased physical activity.[4] Behavioral studies have shown family influence to be a decisive factor.[5,6] Behavior modification has also been successful in a school environment.[7]

Recently, Ganley[8] applied the theories of Minuchin to obesity and suggested that they should be tested in clinical practice. To our knowledge, this is the first study on the effects of family therapy used as an aid in changing lifestyle. The basic idea is that intervention in the family context has a greater impact on the adolescent child than has individual counseling. Facilitating family functioning, irrespective of whether it is impaired or not, improves the chance of maintaining a socially and medically acceptable weight regardless of the individual's genetic susceptibility. Family therapy has earlier been shown to be helpful in diabetes, childhood asthma, anorexia nervosa, adult schizophrenia, and bereavement (reviewed by Dare[9] and Lask[10]).

## MATERIALS AND METHODS

### Screening of the Two Treatment Groups

Of the families of 1906 children aged 10 to 11 years who were screened for obesity at school, 1774 agreed to the participation of their children in the study. Forty-nine children were defined as obese in terms of a body mass index (BMI) of more than 23.0 kg/m$^2$, a cutoff level representing the mean + 2.4 times the standard deviation of the screened population [17.2 + (2.4 × 2.4) = 23.0]. At follow-up 4 to 6 months later, 44 children (21 boys, 23 girls) with a mean BMI of 25.1 ± 2.0 SD agreed to participate in the study. All 44 children had skinfold thicknesses (triceps, subscapular and suprailiac, measured with Harpenden calipers) exceeding the 85th percentile for 10- to 11-year-old Swedish children.[11]

All but two children (BMIs 20.4 and 21.2, respectively) had BMIs ≥ 22.0 kg/m$^2$ (= mean +2 SD) at the 4- to 6-month follow-up. Of these two children, one was randomized into the family therapy group, the other into the conventional treatment group

The 44 children were randomly assigned to one of the two treatment groups, the family therapy group being larger to allow for the expected higher dropout rate in that group. The first group, 9 girls and 10 boys, received conventional treatment. The second group, 14 girls and 11 boys, underwent family therapy. (One of the girls in the latter group was a pilot case whose data are not included in the results.) In both groups the duration of treatment was 14 to 18 months. As the treatment program started 6 months after screening, the children were approximately 14 years of age at the 1-year follow-up, ie, 1 year after the treatment stopped. The *conventional treatment* consisted of dietary counseling by a dietitian and regular visits to an experienced pediatrician with an interest

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in weight problems. Ten of 19 families were seen by the dietitian once. The remaining families were satisfied with the counseling given by the pediatrician, whom they visited twice during the first 6 months and then every 6 months during the rest of the study, ie, five visits in all. The diet prescribed contained 15 to 1700 calories, and the families were also advised to reduce the energy content of fat in the food to 30%. The *family therapy* group received the same dietary counseling, and they received medical checkups by another pediatrician; in addition, the pediatrician and a psychologist offered six family therapy sessions spread over 1 year. At these sessions the psychologist was the therapist in 50% of cases (randomly selected), with the pediatrician observing from behind a one-way mirror screen, and if necessary intervening by phone, the procedure being reversed in the other 50% of cases. A supervisor was present to assist in approximately one third of cases. All the sessions were videotaped.

In the programs for the two groups the importance of exercise was emphasized and exercise by the obese children was encouraged.

Of the 19 children in the conventional treatment group, 15 participated in the control at the end of therapy and the checkup 1 year later. Weight and height measurements of the remaining 4 children were obtained by the school nurse, these data also being included in the analyses.

Of the 24 children given family therapy, 4 dropped out after one session, and another two after three sessions. One child did not participate in family therapy but attended checkups. The weight and height data of 2 other children who likewise failed to participate in family therapy were obtained by the school nurse. Thus 15 children attended the 1-year follow-up, and another 5 were measured by the school nurse. Of the remaining 4 children no data were available for 1 of them at the end of treatment (this child had a BMI of 25.6 at the start of treatment), whereas for the other 3 children the BMIs at the start of treatment as compared with the end were 24 6 vs 21.8, 24.4 vs 24.8, and 27.9 vs 29.2.

All available data, except for the pilot case, have been included in the analysis.

The families were asked to answer a structured questionnaire covering such background data as the weight of the parents and siblings. Twenty children (45%) had one obese parent and 13 (30%) had two. Seventeen children had no siblings, and 11 had at least one obese sibling.

Before treatment, at the end of treatment, and at the 1-year follow-up, the children in both treatment groups underwent physical examination. At this examination triceps, subscapular, and suprailiac skinfold thicknesses were measured with Harpenden calipers. The children were clinically euthyroid at enrollment. Their blood thyroid status was checked later during the study and found to be normal. All had blood pressures of less than 140/90, and none manifested clinical signs of endocrine disorder. The same investigator examined each individual throughout the study.

Before treatment and at the 1-year follow-up, the work capacity of the children was evaluated with a bicycle ergometer, the work load being expressed as watts per kilogram for normal weight and actual height at a pulse of 170.[12]

### Screening of the Control Group

Of the 1568 children at the second screening, weight and height data were available, both at the fourth and eight grades (10 to 11 and 14 years of age, respectively), for 1560 who were used as an untreated control group. Their measurements as eighth graders, at the age of 14, age-matched with the two treatment groups, were specially collected for the study, those as fourth graders being obtained from school records. Of 50 children (31 girls and 16 boys plus 3 whose gender was not recorded) selected for obesity at 10 to 11 years of age (ie, a BMI > 23.0 kg/m$^2$), data were also available at the eighth grade for 48 whose mean BMI was 25.1 ± 2.5 SD. The mean BMI for the general age-matched population was 17.2 ± 2.4 SD at the first screening and 17.1 ± 2.4 SD at the second (10- to 11-year-old, fourth grade). The BMI cutoff limit for obesity of 23.0 kg/m$^2$ adopted at the first screening was retained at the second screening. Fourth-grade BMI values manifested no significant gender-related difference.

The Mann Whitney *U* test, Fisher's Exact Test, the $\chi^2$ test, and analysis of covariance and variance were used for statistical evaluation of the data.

### Family therapy

In this context, family therapy was defined as a model of treatment aimed at involving the whole family, or a significant part of it. Family therapy is usually regarded as a form of brief therapy because the number of sessions is limited to 5 to 10. In the different types of brief strategic therapy (some of which are called strategic family therapy), the therapist assumes responsibility for defining what happens during treatment and designs strategies to create change in the system, as reviewed by Eisenberg and Wahrman.[13] Where brief structural therapy or structural family therapy is concerned, the therapist sees as the first task the assessment of dysfunctional structures in the family. Thereafter interventions are mainly targeted on confusions in the family hierarchy, blurring of boundaries, and the existence of rigid or pathological coalitions.[14] The approach adopted in this study was to give interview sessions at intervals of 3 weeks, mainly on the basis of Minuchin's proposal of how to treat psychosomatic families.[8,14,15] However, it turned out that an interval of 2 to 3 months was a better alternative, as it allowed the families time to change. Thus the overall treatment period was extended to 14 to 18 months.

During therapy the therapists tried to reinforce the resources of the family and to create an optimal emotional climate for helping the obese child. The therapist supported the family's own belief systems in different ways with a view to promoting mutual respect and a confident atmosphere. As a group, the families were quite heterogeneous, which necessitated a rather large degree of therapeutic flexibility.

First the seriousness of the obese condition was defined for the family, if necessary. Then the hierarchy of the family was adjusted with interventions focused on family structure. In addition, we applied techniques from brief therapy as used by de Shazer, as they appeared to enhance the effects of interventions suggested by Minuchin.[13,16,17] The de Shazer model is a brief solution-based therapy focusing, through language, on how to construct solutions. This technique seemed to allow the families more possibilities to change, probably because they felt less guilt, as failures—past or present—were not discussed.

The study design was approved by the Research Ethics Committee of Lund University. In the sample studied, obesity was screened for by weight and height measurements and finally established by clinical examination.

## RESULTS

Weight and height data are presented for the three groups, (ie, family therapy, conventional treatment, and untreated control subjects), irrespective of whether therapy was actually given (intention to treat). There were no significant differences (Mann-Whitney *U* test) in the numbers of obese parents or siblings between the family therapy group and the conventional treatment group.

In the following, all *P* values refer to one-tailed Mann-Whitney *U* test results if not otherwise noted.

At the end of treatment, the family therapy group manifested a significantly smaller increase in BMI (expressed in percent of the initial value) than the conventional treatment group (0.66% vs 2.31%; $P = .042$), and a reduction in subscapular skinfold thickness (−16.8 vs +6.8%; $P = .034$). Mean values for all the groups are shown in Table 1. The increase over 3 years of BMI in a US population of the same ages and degrees of overweight (the 95th percentile) as in the present study was 3.3 (23.5→26.8) for boys and 2.9 (25.7→28.6) for girls.[18] The population from which the untreated control group was drawn manifested the following changes at the 95th percentile for a period of 3 years: 4.4 (21.2→25.6) for boys and 3.2 (22.4→25.6) for girls.

At follow-up 1 year after the end of treatment, the mean BMI differed significantly between the family therapy and the untreated control groups ($P = .046$),

**TABLE 1.** Mean (±SEM) Body Mass Index (BMI) Values and Population Size at Different Stages of the Study*

| Stage of Therapy | BMI, kg/m² | | | P Values (ANOVA) |
|---|---|---|---|---|
| | Family Therapy | Conventional Treatment | Control | |
| Start | 24.7 ± 0.36 (24) | 25.5 ± 0.53 (19) | 25.1 ± 0.35 (50) | .57 |
| End of therapy | 25.0 ± 0.53 (22) | 26.1 ± 0.72 (19) | | .22 |
| One-year follow-up | 25.8 ± 0.73 (20) | 27.1 ± 0.88 (19) | 27.9 ± 0.61 (48) | .15 |

* *P* values derived from analyses of variance (ANOVAs) are indicated with BMIs at the different stages of the study serving as dependent variables and the different types of treatment as independent variables. Numbers of subjects are given in parentheses.

and there was a significantly smaller increase of BMI in the family therapy group than in the untreated control group (mean +5.1 vs +12.0%; $P = .022$). None of the differences between the family therapy and conventional treatment groups, or between the conventional treatment and the untreated control groups, were significant.

At the 1-year follow-up (Tables 2 and 3), severe obesity was defined as a BMI of more than 30 kg/m².[19,20] Fisher's Exact Test showed significantly fewer children with severe obesity in the family therapy group than in the control group (5% vs 29%, $P = .024$, one-tailed; .030, two-tailed). The difference between the family therapy and conventional treatment groups did not reach statistical significance ($P = .08$; Fisher's Exact Test, one-tailed).

There was no difference between the family therapy and the untreated control groups (25% vs 46%; $P = .18$ $\chi^2$ test) when obesity was defined as BMI > mean +3 SD of that in the second screening population. Different limits were used for boys and girls (BMI = 28.4 and 29.3, respectively). Table 2 shows the frequency distributions of the different groups at the 1-year follow-up. Table 3 shows the observed frequency table, but the data did not allow a $\chi^2$ analysis.

No untreated control group was available for comparison of the skinfold thickness and physical fitness data (ie, bicycle ergometry). For all skinfold thicknesses, the differences between the measurements before treatment and those at 1-year follow-up are expressed as percentages in Table 4. Significant differences were found in percent of change for the triceps, subscapular, and suprailiac regions between the family therapy and the conventional treatment groups, $P = .027$, $P = .005$, $P = .002$, respectively.

**TABLE 3.** Observed Frequency Table for Body Mass Index (BMI) Values at the 1-Year Follow-up

| Groups | Family Therapy | Conventional Treatment | Control | Totals |
|---|---|---|---|---|
| BMI≤30 | 19 | 14 | 34 | 67 |
| BMI>30 | 1 | 5 | 14 | 20 |
| Totals | 20 | 19 | 48 | 87 |

**TABLE 4.** Skinfold Thickness Differences in Percent of Initial Values With *P* Values Derived From One-Sided Mann-Whitney *U* Test at the 1-Year Follow-up (15 Children in Each Group)

| Skinfold Thickness | Median Percentage Change (Range) of Skinfold Thickness | | *P* Value |
|---|---|---|---|
| | Family Therapy | Conventional Treatment | |
| Triceps | −7.2 (55) | +8.1 (133) | .027 |
| Subscapular | −13.2 (113) | +19.6 (167) | .005 |
| Suprailiac | −15.1 (113) | +30.1 (178) | .002 |

Physical fitness was measured before treatment and at the 1-year follow-up. At the 1-year follow-up the family therapy group manifested significantly better results, $P = .047$ (Table 5).

The two children (BMIs 20.4 and 21.2) in the screening for the two treatment groups who were randomized into the family therapy and conventional treatment groups, respectively, showed a further weight change during the study of −7% and +8% of the initial BMI value, respectively.

At the 1-year follow-up analysis of variance showed that gender and puberty status did not contribute to the variation of BMI with treatment type as a third factor.

**TABLE 2.** Distribution of Body Mass Index (BMI) Values in the Family Therapy, Conventional Treatment, and Control Groups at the 1-Year Follow-up

| BMI, kg/m² | Family Therapy, No. | Percent of Total | Conventional Treatment, No. | Percent of Total | Control Groups, No. | Percent of Total |
|---|---|---|---|---|---|---|
| 18–20 | 2 | 10 | 1 | 5 | 1 | 2 |
| 20–22 | 1 | 5 | 1 | 5 | 2 | 4 |
| 22–24 | 3 | 15 | 2 | 11 | 4 | 8 |
| 24–26 | 2 | 10 | 3 | 16 | 10 | 21 |
| 26–28 | 7 | 35 | 5 | 26 | 7 | 15 |
| 28–30 | 4 | 20 | 2 | 11 | 10 | 21 |
| 30–32 | 1 | 5 | 2 | 10 | 5 | 11 |
| 32–34 | 0 | 0 | 3 | 16 | 5 | 10 |
| 34–36 | 0 | 0 | 0 | 0 | 2 | 4 |
| 36–38 | 0 | 0 | 0 | 0 | 2 | 4 |

TABLE 5. Results of Physical Fitness (Bicycle Ergometer) Tests in Watts per Kilogram for Normal Weight and Actual Height at a Pulse of 170 (*P* Values Derived From One-Tailed Mann-Whitney *U* Test) at the Start of Treatment and 1 Year After the Treatment Stopped

| Examined at | W/kg for Normal Weight and Height at Pulse 170 (Median and Range) | | *P* Value |
|---|---|---|---|
| | Family Therapy | Conventional Therapy | |
| Start of therapy | 2.02 (1.0) n = 20 | 1.98 (1.2) n = 17 | .48* |
| One-year follow-up | 2.04 (1.3) n = 13 | 1.76 (0.54) n = 10 | .047 |

* Not significant.

There were no pretreatment differences between the groups in any of the above-mentioned variables.

## DISCUSSION

The present findings show family therapy to be effective in preventing the development of severe obesity during childhood. Using the intention-to-treat principle, increase in BMI in the family therapy group was less than in the conventional treatment group at the end of treatment, and less than in the control group at 1-year follow-up ie, 1 year after the treatment was completed (the latter difference was also significant using two-tailed tests). In addition, a significant difference of mean BMI between the family therapy and the untreated control groups was found at the 1-year follow-up.

The increase of BMI both in the population from which the untreated control group was derived and in a US population[18] tended to be higher than the increase of BMI in the family therapy group.

With regard to the most severe cases of obesity (ie, BMI > 30), results in the family therapy group were significantly better than those in the control group (also with two-tailed tests). When compared with the conventional treatment group, the difference was close to statistical significance. What degree of obesity in childhood is predictive of future complications such as cardiovascular disease and diabetes is not known. In adults a BMI of more than 30 is accepted as defining obesity associated with excessive risks of chronic diseases and mortality, a limit we adopted in this study.[19,20] When instead a value of 3 SD above the mean (28.4 in boys and 29.3 in girls) for the 14-year-old control population (ie, from the second screening) was used as a cutoff value, no significant differences were found between the groups. A BMI of more than 30 at the age of 14 is should be a strong risk factor for future severe obesity and concomitant disease. Sorensen[21] has shown on the basis of adoption studies involving obese adults how genetic and environmental influences on the risk of premature death can be distinguished. However, no prospective studies using obese children have been done to confirm this observation.

At the 1-year follow-up (ie, among those who had followed most of the program), the family therapy group had significantly reduced skinfold thickness at triceps, subscapular, and suprailiac sites. The differences for subscapular and suprailiac skinfold values were also significant when two-tailed tests were used. Moreover, the family therapy group manifested significantly better physical fitness at 1-year follow-up than at enrollment in the study. The improvements in skinfold thickness and physical fitness may indicate that the difference between the groups in certain cardiovascular risk factors may be greater than is indicated by the respective BMIs. In children, exercise that results in increased lean body mass increases high-density lipoprotein cholesterol levels.[22] Studies of adults have shown weight reduction using very low-calorie diets to be followed by improved insulin metabolism.[23,24]

Behavioral modification has yielded valuable results in the treatment of obesity.[3] The present study showed that family therapy may be an alternative and fruitful approach. The family therapy techniques used here facilitated the families' own attempts to modify their lifestyle and facilitated their own responsibility and readiness to change, constituting targets during therapy. Thus, the family and not the therapist assumed responsibility for the changes achieved. This may be helpful to the therapist, making the therapeutic process less cumbersome. Instead of the therapist attempting to get obese children to lose weight, it might be more efficient to teach the latter to control their eating patterns through their own efforts.

The findings here need to be confirmed in further studies before they can be accepted generally. Such studies also will be helpful in identifying other equally effective techniques and determine whether family therapy per se is helpful.

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## THE CULTIVATION OF SCIENTISTS AT WOMEN'S COLLEGES

What do the inventors of the following have in common?

1. The cotton gin
2. The microelectrode
3. Nerve growth factor
4. Nuclear fission
5. COBOL computer language
6. Apgar score
7. Smallpox inoculation
8. Tetracycline . . .

Women were responsible for all of the above . . .

1. Cotton gin: Catherine Greene
2. Microelectrode: Ida Hyde, psychologist
3. Rabies vaccination: Rita Levi-Montalcini, biologist
4. Nuclear fission: Chien-Shiang Wu, nuclear physicist
5. COBOL computer language: Grace Hopper, mathematician
6. Apgar score: Virginia Apgar, anesthesiologist
7. Smallpox inoculation: Lady Mary Wortly Montagu, essayist
8. Tetracycline: Gladys Hobby, chemist

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