

Motivating the Obese Child to Move: The Role of Structured Exercise in Pediatric Weight Management

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ABSTRACT

Background. The prevalence of childhood obesity is rapidly increasing. Successful prevention and treatment of childhood obesity depends on increasing the physical activity patterns of obese youth. However, motivating the obese child to participate in physical activity is difficult.

Methods. We designed a four-phase physical activity intervention, consisting of a structured progressive exercise program of moderate intensity, along with motivational methods to increase physical activity and improve body movement awareness.

Results. Seventy-three overweight children participated in the weight management program. They had a significant weight loss and reduction in body fat, which was maintained at 1-year follow-up. Subjects also maintained lean body mass and showed improved physical activity patterns.

Conclusions. Progressive exercise, used in conjunction with nutrition and behavior modification, provides successful motivational strategies. These strategies encourage increased physical activity patterns, the adoption of regular structured exercise training, and the loss of excess body fat.

THE BEHAVIOR PATTERNS of today's American youth show a growing trend toward unhealthy life-style attitudes and practices.¹⁻³ School-aged children are becoming fatter and less active, and thus less physically fit.⁴⁻⁶ A weight that exceeds ideal body weight by 20% defines childhood obesity. More than one fourth of children in the United States are considered clinically obese.⁴ The National Children and Youth Fitness Study and other investigations indicate that at least half of today's youth do not engage in physical activity appropriate to long-term health promotion and that less than 36% of elementary and secondary schools offer daily physical education classes.⁷⁻⁹

The overweight child is caught in a vicious cycle. Obesity will reduce activity due to joint discomfort and distressed breathing.¹⁰⁻¹² Once activity is reduced, body fat will continue to increase, creating even more aversion to exercise.

One problem facing many physical education teachers and clinical health educators, in particular, is motivating obese students to par-

ticipate in physical activities. Recently, the idea of learned helplessness has been suggested as a probable reason for lack of motivation. It also provides possible interventions for general health education and physical activity.^{13,14} With learned helplessness, children justify the causes of bad events in their lives as stable in time, global in effect, and internal to themselves. Such children have a cluster of helplessness deficiencies, including (1) passivity/non-assertiveness, (2) cognitive flaws and inability to recognize existing opportunities to control outcomes, (eg, being unable to see alternatives), (3) sadness, (4) lowered self-esteem, (5) lowered competitiveness/achievement-oriented behavior, and (6) lack of motivation, initiative, and persistence.¹⁵ These children may also be extremely fearful. Learned helplessness is a maladaptive habit of withdrawing from definable, manageable adversities through succumbing to everyday problems.¹⁶ This conclusion is derived from studies reporting that deprived subjects display a sense of personal inadequacy, negative self-image, self-blame, pessimism, low achievement motivation,¹⁷ and the expectation of future incompetence when subjects are compared with nondeprived counterparts. A learned helplessness response is shown by cognitive, motivational, and emotional deficits that follow expo-

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TABLE 1. Characteristics of Patients Enrolled

Level of Obesity	No. of Patients			Ethnicity		Mean Age (yr)
	Total	Male	Female	Black	White	
Mild	15	3	12	0	15	11.6
Moderate	42	24	18	11	31	11.5
Severe	16	6	10	8	8	12.7
All	73	33	40	19	54	11.8

sure to uncontrollable events.¹⁸ Children and adults avoid situations they believe exceed their capabilities and make them feel helpless. However, they undertake and do with self-confidence things they believe they can do and will derive benefit from. Given appropriate skills and incentives, personal efficacy beliefs are a major determinant of children's choice of behavior, how much effort they will expend, and how long they will sustain effort in dealing with uncomfortable or new situations.¹⁹

Social Cognitive Theory²⁰ provides four training ideas that influence motivation to adopt any behavior (eg, diet modification and physical activity). According to this theory, children are motivated to behave a certain way if they believe that the targeted behavior will benefit them (outcome expectancy) and if they believe they can do the intended behavior (self-efficacy). Social Cognitive Theory recognizes a shared blend between circumstances, thinking processes, and behavior, which are interacting determinants of each other. Initiation and maintenance of behavior (either health enhancing or health hindering) are partially governed by judgments of self-efficacy (expectations of personal competence or ability).

Self-efficacy beliefs are learned from four separate sources: (1) knowledge transfer,²¹⁻²⁴ (2) emotional or physiologic feedback when associated with behavioral performance,^{25,26} (3) clear success or failure events, or mastery experiences,²⁷ and (4) vicarious experiences through observational learning, or modeling and imitation.²⁸⁻³⁰

Our study investigates the role of motivational methods and progressive exercise as means of increasing physical activity in children enrolled in a multidisciplinary pediatric weight management program.

METHODS

Subjects

Between June 1992 and December 1993, 73 subjects (33 boys and 40 girls) aged 7 to 17 years (mean age, 11.8 years) were assigned to

three treatment groups according to the severity of obesity: Phase I (30 weeks) for those severely obese ($\geq 200\%$ of ideal body weight [IBW]); Phase II (20 weeks) for those moderately obese (150% to 199% of IBW); and Phase III (10 weeks) for those mildly obese (121% to 149% of IBW) (Table 1). When goal weight was attained ($\leq 120\%$ of IBW), subjects began Phase IV, the "maintenance" phase. Routine evaluations included a comprehensive medical history and physical examination. Patients with evidence of cardiovascular disease, diabetes, or other chronic systemic disease were excluded from the study. Informed consent was obtained from the subjects and their legal guardians.

Anthropometric measurements were done at enrollment, at 10 weeks, and at 1 year. Physical activity was measured at baseline and after 10 to 30 weeks. Weight was measured with an electronically calibrated Detecto scale. Height was measured with a calibrated Holtain stadiometer. Ideal body weight percentages (%IBW) were based on National Center for Health Statistics percentiles for height and weight. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Relative fat (%) and fat-free mass were calculated by measurement of skinfolds (triceps and subscapular) according to the formula described by Slaughter et al.³¹ The self-report scale³² for physical activity level was used to evaluate exercise levels. Subjects also reported volume (frequency [days per week] and duration [minutes per session]) of activity each week on exercise record cards.

Program Description

Researchers in the Department of Pediatrics at the Louisiana State University Medical Center School of Medicine and the General Clinical Research Center, Medical Center of New Orleans, conducted a 1-year, repeated measure outcome clinical trial. The clinical intervention used a protein-sparing modified fast (PSMF) diet, behavior modification, and a progressive (ie, gradually increasing in volume) exercise program of moderate intensity (defined as 45% to 55% of volume of oxygen consumed at maximal exercise effort [VO_{2max}]). The program is a four-phase, multidisciplinary intervention model, entitled "Committed to Kids Pediatric Weight Management." Details of the program's intervention components have been described pre-

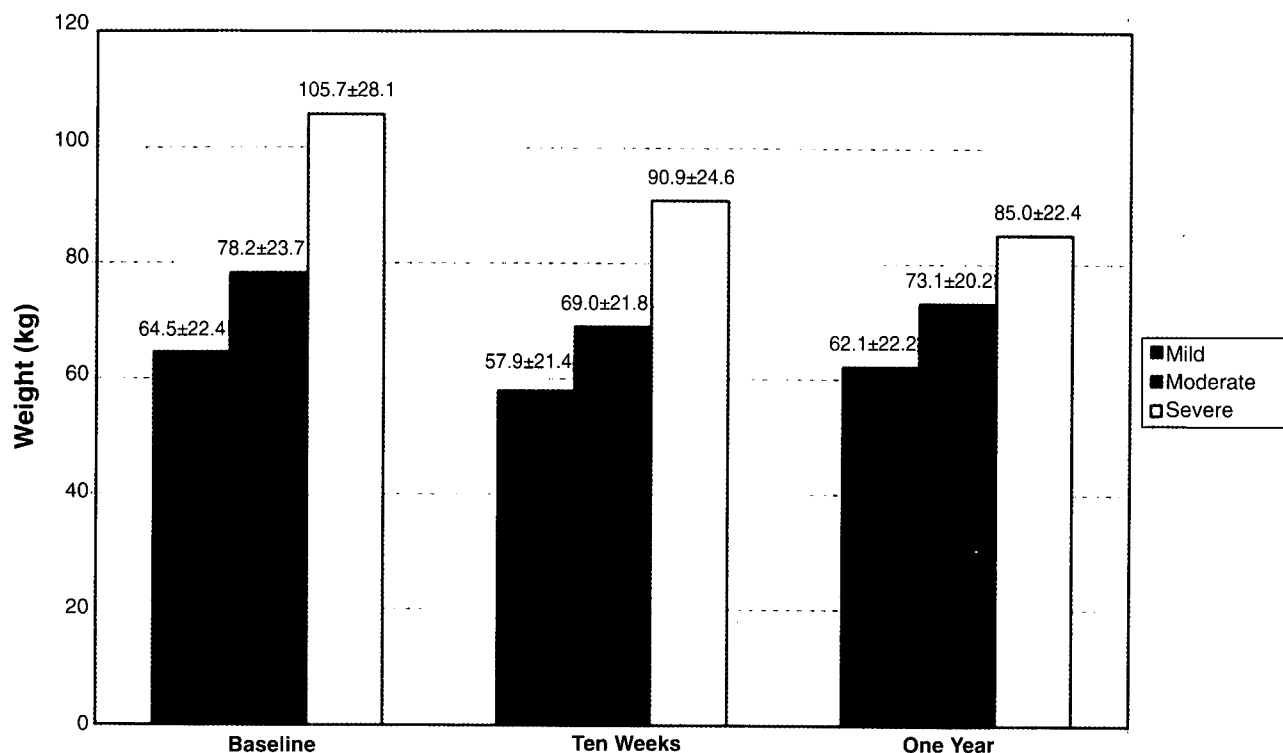


FIGURE 1. Changes in total body weight by obesity treatment group. Ten-week and 1-year values were significantly different from baseline ($P < .001$); 10-week values were not significantly different from 1-year values.

viously.^{*33} In summary, the PSMF diet consisted of 2 g of protein per kilogram IBW per day, supplied by lean meat or fish (up to 100 g/day), and provided approximately 600 to 800 kcal/day. Carbohydrate intake was limited to a maximum of 20 to 25 g/day to induce ketosis. Diets were supplemented with additional noncaloric fluid, minerals, and vitamins.³⁴ The PSMF diet was followed for 30 weeks by the severely overweight students (phase I), 20 weeks by the moderately overweight students (phase II), and 10 weeks by the mildly overweight students (phase III). The 10- to 30-week acute weight-reduction period was followed by a long-term reinforcement period lasting for 22 to 42 weeks and consisting of a balanced caloric-deficit diet of 1,200 kcal, continued exercise, nutrition education, and active behavior modification.

Parents, siblings and extended family were encouraged to participate in the many varied activities offered during the exercise portion of the weekly meetings. Likewise, parents' participation at home with their children during exercise sessions improved compliance and overall success. The needs of the overweight child have been shown to vary with respect to

their individual severity of obesity.³³ The four-phase exercise intervention program was designed to specifically address these individual needs.

The exercise program was specific to the level of obesity, ie, initially the severely obese students had shorter beginning exercise durations and frequencies than did the moderately or mildly obese subjects. In addition, because excess fat weight places an increased burden on an individual's cardiorespiratory and musculoskeletal systems, the recommended exercise activities for the moderately obese and severely obese children were arm-specific and less weight bearing. Students were allowed to choose the type of aerobic activity from an extensive list provided in the handbooks and exercise videos developed by the program staff.

RESULTS

Of the original 73 subjects, 69 (95%) completed their initial phase of 10, 20, or 30 weeks. Forty-eight subjects (67%; 18 boys and 30 girls) completed the entire 1-year program. Table 2 shows characteristics of the patients who dropped out; except for a male preponderance, they are not statistically different from the overall group of patients. Initial body weights were significantly decreased at 10

*Interested parties may request a copy of the program guidelines from the authors.

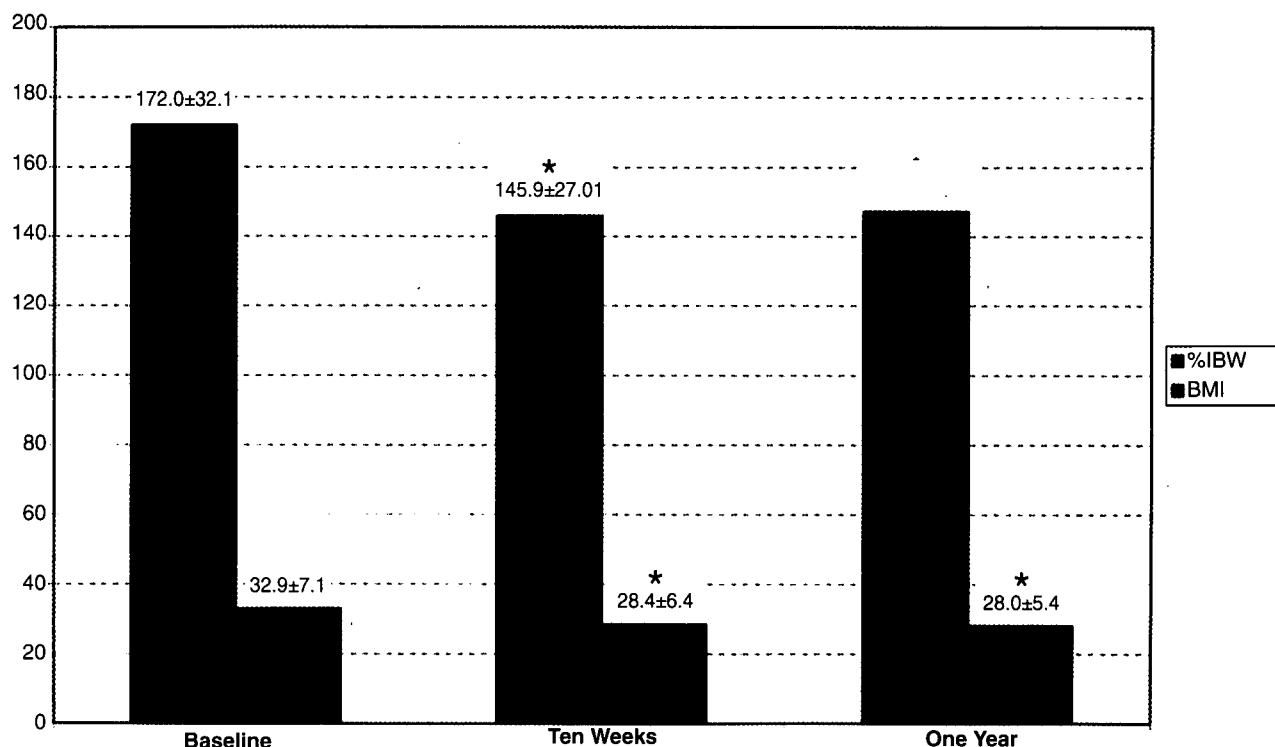


FIGURE 2. Changes in percent ideal body weight (%IBW) and body mass index (BMI) in children enrolled in pediatric weight management program. Ten-week and 1-year values were significantly different from baseline (enrollment) values; 10-week and 1-year values did not differ significantly (* $P < .001$, one-way ANOVA, Newman-Keuls test).

580

weeks from 64.5 kg to 57.9 kg in the mildly obese, 78.2 kg to 69.0 kg in the moderately obese, and 105.7 kg to 90.9 kg in the severely obese patients ($P < .001$, ANOVA, Newman-Keuls test) (Fig 1). Mean %IBW of the 48 patients was significantly decreased at 10 weeks from 172.0% to 145.9% and was maintained at 52 weeks at 147.2% ($P < .001$, ANOVA, Newman-Keuls) (Fig 2). Percent fat was significantly decreased at 10 weeks from $43.1 \pm 7.1\%$ to $33.9 \pm 7.1\%$ and was maintained at 52 weeks at $34.5 \pm 6.2\%$ fat ($P < .0001$, ANOVA, Newman-Keuls) (Fig 3). Fat-free mass did not change significantly (Fig 4). Mean BMI of the 48 patients was decreased from 32.9 ± 7.1 to 28.4 ± 6.4 at 10 weeks and was maintained at 52 weeks at 28.0 ± 5.4 ($P < .001$, ANOVA, Newman-Keuls) (Fig 2). Among subjects completing the 10- to 30-week program, a significant increase was observed in their self-reported daily activity levels ($P < .05$).

DISCUSSION

Regular physical activity has been linked to improvements in risk profiles for hypertension, non-insulin-dependent diabetes mellitus, osteoporosis, cancer, and anxiety/depression.^{35,36} These benefits may exist independently of improvements in functional aero-

bic capacity, suggesting that exercise of moderate intensity may be adequate to stimulate the desired health-promoting benefits.³⁵ Revised guidelines now suggest that adults should participate in at least 30 minutes of moderate physical activity daily or during most days of the week.^{37,38} However, although the American population has been informed of these recommendations, the majority of individuals in the United States remain sedentary.³⁵

Exercise treatment recommendations for childhood obesity include reductions in sedentary behavior, participation in activities with a high caloric cost, and walking programs.^{39,40} However, specific guidelines for intensity, duration, frequency, and type of exercise are unclear.⁴¹ The small number of controlled clinical weight loss intervention studies in obese

TABLE 2. Characteristics of Patients (n = 25) Who Did Not Complete the One-Year Program

	Drop-outs	All	P Value
Mean age (yr)	11.7	11.8	NS
Mild obesity	2	15	NS
Moderate obesity	17	42	NS
Severe obesity	6	16	NS
Race (white/black)	16/9	54/19	NS
Sex (male/female)	16/9	33/40	.02
Mean initial weight (kg)	78.8	79.6	NS
Mean 10-week weight loss (kg)	6.5	8.6	NS

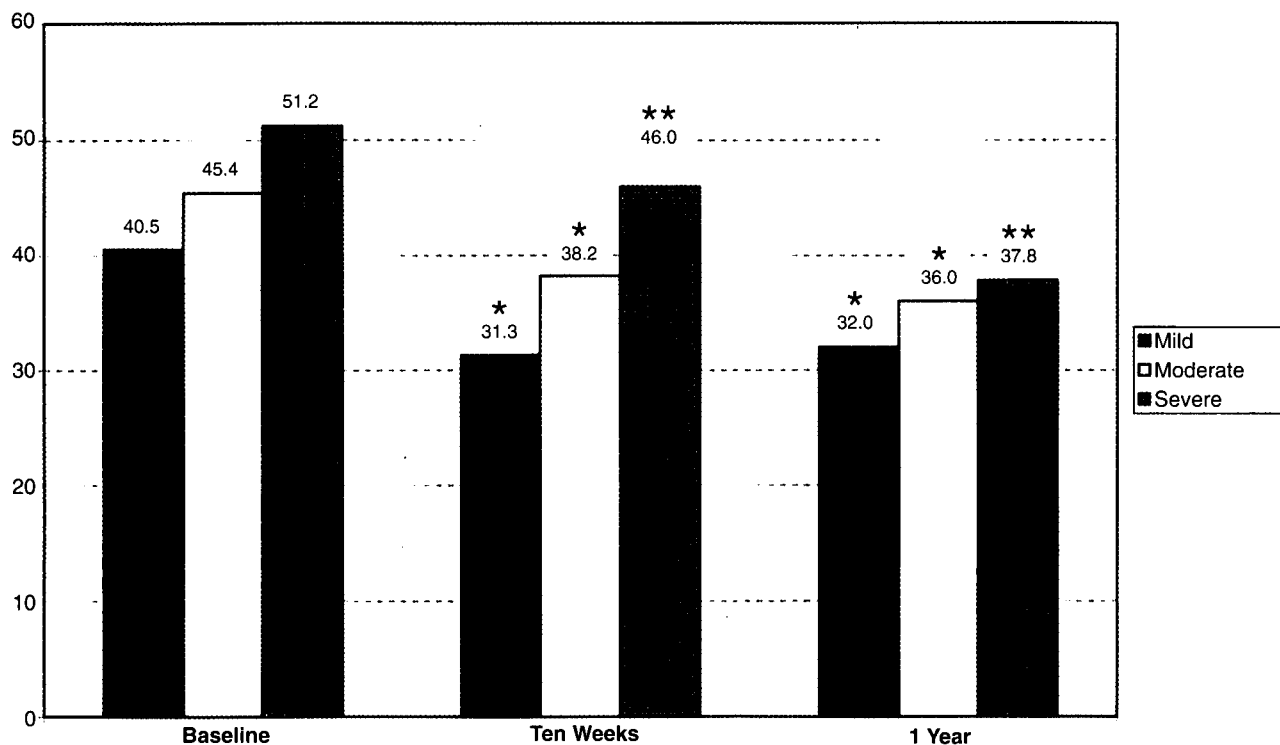


FIGURE 3. Changes in relative fat (%) in obese children. *Ten-week and 1-year values were significantly different from baseline ($P < .01$); 10-week values were not significantly different from 1-year values. **Ten-week and 1-year values were significantly different from baseline ($P < .01$), and 10-week values were significantly different from 1-year values ($P < .05$).

children have resulted in limited success.³⁹ The studies provide descriptions of exercise protocols, which are generalized across all levels of childhood obesity. Although the varied results of these studies allow only limited conclusions, the findings suggest that exercise is an important factor in treating pediatric obesity.³⁹

Epstein and colleagues⁴² examined the efficacy of three different types of exercise treatment programs for obese children. They found no differences in the weight maintenance of obese children participating in aerobic exercise, calisthenics, and life-style changes during the first year of treatment. However, during the second year follow-up, the life-style exercise group maintained the weight loss, while the other subjects participating in calisthenics and aerobic exercise gained significant amounts of weight.

Becque et al⁴³ also showed that the addition of structured exercise reduced the multiple coronary artery disease risk profile of obese adolescents. The exercise program was based on an intensity of 60% to 80% of age-predicted maximum with progressively increasing duration by 5 minutes each week for 8 weeks. The recommended activities included those involving movement of the total body weight, such as walking, jogging, swimming, and aero-

bic dancing, to promote maximum caloric expenditure.

Obese children are physiologically and emotionally different from children of normal weight.¹⁴ Nieman⁴⁴ suggested that individuals should receive specialized programs specific to their level of obesity and their individual needs. Therefore, successful intervention may depend on the use of specialized exercise programs designed to the obese child's specific needs. By also considering the cognitive as well as the physical and emotional developmental status of the obese child, appropriate activities can be implemented. If the student is cognitively ready to receive the information and physiologically capable of performing the physical task, then the instructor should experience success in (1) motivating the obese child to participate in the physical activity, (2) encouraging the child to maintain increased physical activity patterns, and (3) promoting the student's acquisition of educational concepts that support the physical activity.

When designing exercise programs for obese children, the instructor should consider activities that are easily mastered. Such activities will ensure that students experience initial success when participating in physical activity if adherence to the program is desired.

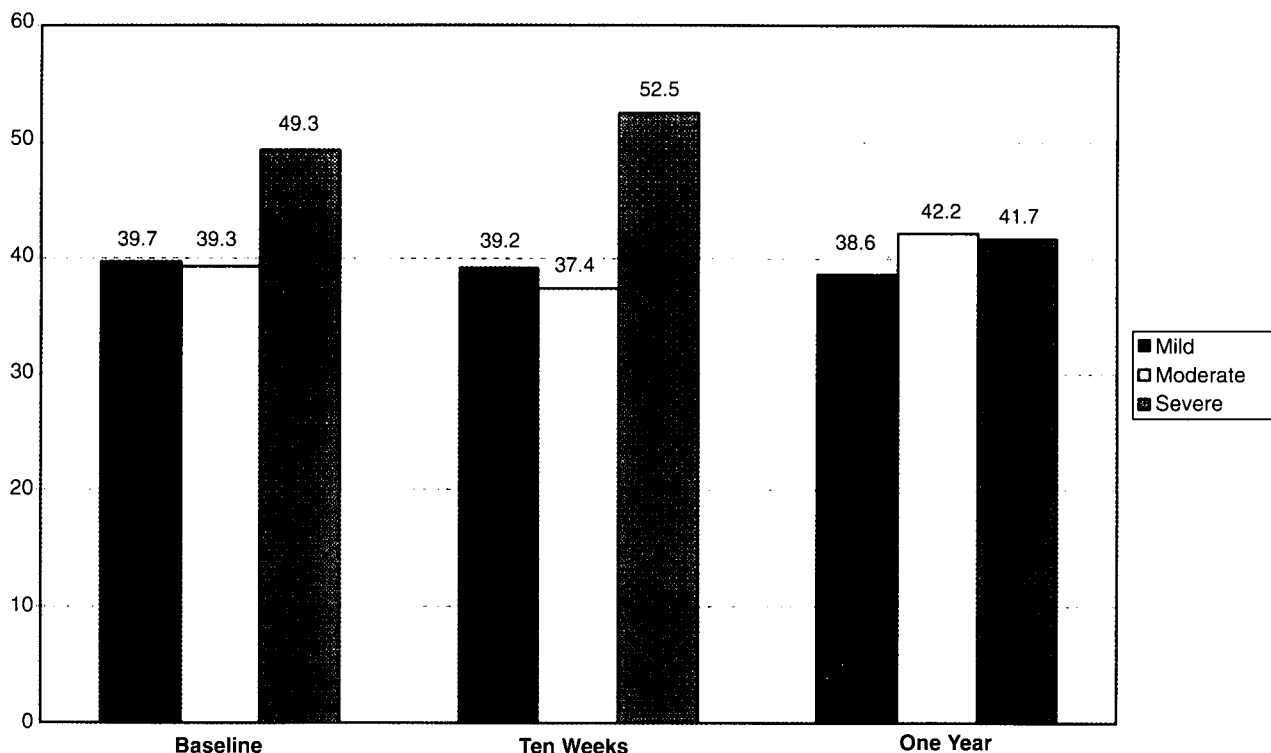


FIGURE 4. Changes in lean body mass (kg) in obese children. No significant differences could be observed over time.

Competitive sports with nonobese counterparts may not be appropriate because of the limited physiologic capacity of the obese child and the additional risk of injury due to excess weight on the premature musculoskeletal system.⁴⁵⁻⁴⁷

To promote attitude changes that encourage the adoption of a healthy life-style, such as increased physical activity, researchers have previously used persuasive messages through educational interventions. Weaknesses were observed in this approach, specifically with regard to the lack of congruency between attitude and behavior.⁴⁸ Pellegrino⁴⁹ has suggested that although education is the most common method in health-promoting interventions, few studies have illustrated a direct cause-and-effect relationship between education and behavior change.

The Committed to Kids pediatric weight management program is an individualized approach to the prevention and treatment of obesity, conducted in a group family setting. The primary goal is the improvement of the child's physical and emotional health and well-being. Weight loss is just a by-product of the overall focus of the program: to assist the patient and his family in making healthy life-style changes, thus promoting positive alter-

ations in body weight. The group family setting has the added benefit of encouraging peer modeling among the students.

The moderate progressive exercise intervention component is a vital part of the program. Unlike the typical physical education class setting where the obese child often feels inhibited, in the MPEP setting all of the students and family members feel comfortable around peers who possess the same level of physical conditioning. The obese students learn while they participate in physical activity. They move while they listen. They are provided with specific activities that are challenging but can always be accomplished. Positive attention reinforces their behavior changes. Positive role models are provided by the teachers and the parents of the children. Short-term goals are set and reached. As obese children graduate from one phase to another, they increase their self-reported physical activity and thus their level of fitness. They may also increase their knowledge of health and fitness concepts and their ability to manage their weight and their medical condition more effectively. The appropriate exercise intensity, skill level, and modality of the activities guarantee initial success to all class members, thus enhancing mastery concepts that may encourage an increase in physical activity patterns.

The Committed to Kids program serves as a support group for overweight children who tend to be more motivated to lose weight once they see other children dealing with the same problem. Based on the Social Cognitive Theory, the structured exercise prescription and educational curriculum provide four training concepts: knowledge, physiologic feedback, mastery, and modeling. When used in conjunction with the other Committed to Kids program strategies—medical supervision, nutrition, and behavior modification—MPEP promotes the adoption of behavior that enhances body composition and improves the long-term maintenance of weight loss. Furthermore, although preliminary, results indicate that MPEP may improve physical activity patterns in obese youth.

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