

Short- and Long-Term Beneficial Effects of a Combined Dietary–Behavioral–Physical Activity Intervention for the Treatment of Childhood Obesity

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ABSTRACT. *Background.* Obesity has become the most common pediatric chronic disease in the modern era. Early prevention and treatment of childhood and adolescent obesity is mandated. Surprisingly, however, only a minor fraction of obese children participate in weight reduction interventions, and the longer-term effects of these weight-reduction interventions among children have not been elucidated.

Objective. To examine prospectively the short- and long-term effects of a 3-month, combined dietary-behavioral-physical activity intervention on anthropometric measures, body composition, dietary and leisure-time habits, fitness, and lipid profiles among obese children.

Methods. In this randomized prospective study, 24 obese subjects completed the 3-month intervention and were compared with 22 obese, age- and gender-matched, control subjects.

Results. At 3 months, there were significant differences in changes in body weight (-2.8 ± 2.3 kg vs 1.2 ± 2.2 kg), BMI (-1.7 ± 1.1 kg/m² vs -0.2 ± 1.0 kg/m²), body fat percentage (from skinfold tests; $-3.3 \pm 2.6\%$ vs $1.4 \pm 4.7\%$), serum total cholesterol level (-24.6 ± 15.1 mg/dL vs 0.8 ± 18.7 mg/dL), low-density lipoprotein cholesterol level (-23.3 ± 15.2 mg/dL vs -3.7 ± 17.3 mg/dL), and fitness (215 ± 107 seconds vs 50 ± 116 seconds) in the intervention group versus the control group. After a 1-year follow-up period, there were significant differences between the intervention group ($n = 20$) and the control group ($n = 20$) in body weight (0.6 ± 6.0 kg vs 5.3 ± 2.7 kg), BMI (-1.7 ± 2.3 kg/m² vs 0.6 ± 0.9 kg/m²), and body fat percentage. There was a significant increase in leisure-time physical activity among the intervention participants, compared with a decrease among the control subjects.

Conclusions. Our data demonstrate the short- and longer-term beneficial effects of a combined dietary-behavioral-physical activity intervention among obese children. These results highlight the importance of multidisciplinary programs for the treatment of childhood obesity and emphasize their encouraging long-term effects. *Pediatrics* 2005;115:e443–e449. URL: www.pediatrics.org/cgi/doi/10.1542/peds.2004-2172

pediatrics.org/cgi/doi/10.1542/peds.2004-2172; *obesity, multidisciplinary treatment, childhood, exercise.*

ABBREVIATIONS. LDL, low-density lipoprotein; TG, triglyceride; HDL, high-density lipoprotein.

Childhood obesity has reached epidemic proportions worldwide, despite major efforts to promote weight reduction. The mechanisms responsible for the increasing prevalence of childhood obesity are not understood completely, but lifestyle changes associated with increased caloric intake and decreased energy expenditure play probably critical roles.^{1,2}

Childhood obesity is associated with increased risk of hyperlipidemia, hypertension, insulin resistance, diabetes mellitus, and arteriosclerosis later in life.^{3,4} In addition, long-term follow-up results indicate that obese children and adolescents tend to become obese adults.⁵ Moreover, adults who were obese children have increased morbidity and mortality rates independent of their adult weight.⁶ Therefore, prevention and treatment of obesity must start during childhood. It is surprising that relatively few intervention programs are available for obese children and adolescents and that treatment is initiated for <20% of obese children.⁷ Moreover, current data on the long-term effects of weight management programs for childhood obesity are limited.

We previously reported the favorable immediate effects of a 3-, 6-, and 12-month multidisciplinary (nutritional, behavioral, and exercise) intervention on BMI and physical fitness among children and adolescents.^{8,9} The aim of the present study was to examine prospectively the long-term (1-year) effects of a brief (3-month), combined dietary-behavioral-physical activity intervention on body weight, BMI, BMI percentile, body composition, habitual physical activity, fitness, and serum lipids among obese Israeli children and adolescents.

METHODS

Power Analysis

The sample size calculation for this study was based on the previously reported intervention changes in body weight and BMI percentile among children.⁸ With a 2-sided, .05 significance level ($\alpha = .05$), with weight change as the primary variable, 18 subjects in each group would allow us to detect a significant difference at 90% power. For BMI percentile, 11 subjects per group would be

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Effects of Contingent Television on Physical Activity and Television Viewing in Obese Children

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ABSTRACT. *Objective.* Elevated television (TV) viewing and physical inactivity promote obesity in children. Thus, changes in physical activity and sedentary behavior seem critical to treating childhood obesity.

Present Study. Using a randomized, 2-arm design, this pilot study tested the effects of contingent TV on physical activity and TV viewing in 10 obese children. TV viewing was contingent on pedaling a stationary cycle ergometer for experimental participants but was not contingent on pedaling for control participants. The study was conducted over 12 weeks, including a 2-week baseline period.

Results. Multivariate analyses indicated that the intervention significantly increased pedaling and reduced TV-viewing time. During the treatment phase, the experimental group pedaled 64.4 minutes per week on average, compared with 8.3 minutes by controls. The experimental group watched 1.6 hours of TV per week on average, compared with 21.0 hours per week on average by controls during this phase. Secondary analyses indicated that the experimental group showed significantly greater reductions in total body fat and percent leg fat. Total pedaling time during intervention correlated with greater reductions in percent body fat ($r = -0.68$).

Conclusions. Contingencies in the home environment can be arranged to modify physical activity and TV viewing and may have a role in treating childhood obesity. Contingent TV may be one method to help achieve this goal. *Pediatrics* 2001;107:1043–1048; *childhood obesity, television, physical activity, sedentary behavior, behavioral therapy.*

ABBREVIATIONS. TV, television; RPM, revolutions per minute; VO_2max , maximal oxygen consumption; DXA, dual-energy x-ray absorptiometry; MANOVA, multivariate analysis of variance.

The prevalence of childhood obesity has increased substantially in recent decades,^{1,2} a concerning finding given its associated health complications.^{3,4} It is known that obesity is environmentally influenced in part^{5,6} and that a sedentary

lifestyle and sustained physical inactivity may be risk factors for obesity in youth.⁷ Of particular concern is television (TV) viewing, which has been associated with childhood obesity in both cross-sectional⁸ and longitudinal studies.^{9,10} These data suggest the potential utility of targeting TV-viewing practices for treating childhood obesity.

Behavioral interventions have been generally effective in producing short- and long-term weight loss in obese children.^{11–13} Although data are limited, recent behavioral programs have been developed that specifically target reductions in TV-viewing time.^{14,15} These approaches rely on methods such as information dissemination and restricted TV accessibility. An alternative approach has attempted to capitalize on the reinforcing value of TV to increase children's physical activity.^{16,17} Based on behavioral theory,¹⁸ Epstein and colleagues demonstrated that children would increase pedaling on a cycle ergometer to obtain access to contingent TV. For example, by making movie viewing and video game playing contingent on pedaling a cycle ergometer, Saelens and Epstein¹⁷ successfully increased obese children's biking in the laboratory.

The present pilot study tested the effects of a contingent TV system on obese children's physical activity and TV-viewing time in the home environment over several months. The intervention consisted of a cycle ergometer that electrically interfaced with a TV so that pedaling was necessary to activate the TV. This contingent TV system, colloquially called the "TV cycle," used TV as a continuous and immediate incentive to increase children's physical activity in the home. It was hypothesized that, compared with a control condition in which TV accessibility was not contingent on pedaling, the experimental group's physical activity would increase and TV viewing would decrease over a 12-week period. Secondary analyses compared changes in body fat between the 2 groups.

METHODS

Participants

Ten obese children 8 to 12 years old participated in the study. The sample included 3 girls and 7 boys. Eligible participants: 1) had a body mass index above the 85th percentile for age and sex from the first National Health and Nutrition Examination Survey¹⁹; 2) watched at least 2 hours of television per day as assessed by self-report; 3) did not engage in regular physical activity, as indicated by parental report; 4) went home directly after school most days of the week, so that the device could achieve a measurable effect; 5) had no siblings within 7 years of age, so as to

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Study protocol

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Cross sectional study of childhood obesity and prevalence of risk factors for cardiovascular disease and diabetes in children aged 11–13

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Abstract

Background: Childhood obesity levels are rising with estimates suggesting that around one in three children in Western countries are overweight. People from lower socioeconomic status and ethnic minority backgrounds are at higher risk of obesity and subsequent CVD and diabetes.

Within this study we examine the prevalence of risk factors for CVD and diabetes (obesity, hypercholesterolemia, hypertension) and examine factors associated with the presence of these risk factors in school children aged 11–13.

Methods and design: Participants will be recruited from schools across South Wales. Schools will be selected based on catchment area, recruiting those with high ethnic minority or deprived catchment areas. Data collection will take place during the PE lessons and on school premises. Data will include: anthropometrical variables (height, weight, waist, hip and neck circumferences, skinfold thickness at 4 sites), physiological variables (blood pressure and aerobic fitness (20 metre multi stage fitness test (20 MSFT))), diet (self-reported seven-day food diary), physical activity (Physical Activity Questionnaire for Adolescents (PAQ-A), accelerometry) and blood tests (fasting glucose, insulin, lipids, fibrinogen (Fg), adiponectin (high molecular weight), C-reactive protein (CRP) and interleukin-6 (IL-6)). Deprivation at the school level will be measured via information on the number of children receiving free school meals. Townsend deprivation scores will be calculated based on the individual child's postcode and self assigned ethnicity for each participating child will be collected. It is anticipated 800 children will be recruited. Multilevel modeling will be used to examine shared and individual factors associated with obesity, stratified by ethnic background, deprivation level and school.

Discussion: This study is part of a larger project which includes interviews with older children regarding health behaviours and analysis of existing cohort studies (Millennium cohort study) for factors associated with childhood obesity.

The project will contribute to the evidence base needed to develop multi-dimensional interventions for addressing childhood obesity.