

Empirically Supported Treatments in Pediatric Psychology: Pediatric Obesity

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Objective: To review the efficacy of existing interventions for pediatric obesity with reference to the Chambless criteria.

Methods: Chambless criteria for determining treatment efficacy were applied to 42 randomized studies involving nonschool-based programs targeting childhood and adolescent weight loss.

Results: We summarize the following dimensions of the pediatric obesity treatment literature: description of participants, diagnostic criteria for study participation, experimental design, treatment protocol, treatment outcome, and follow-up.

Conclusions: There is strong evidence for the short- and long-term efficacy of multicomponential behavioral treatment for decreasing weight among children relative to both placebo and education-only treatments. Conclusions about adolescent obesity treatment programs are more tentative as they have been less frequently examined, less rigorously controlled, and usually have not conducted long-term follow-up. Current research appears to be working to identify more efficacious treatments for pediatric obesity by exploring the specific behavioral strategies that will be most effective in modifying children's eating and physical activity habits.

Key words: *obesity; pediatric; children; adolescents; empirically supported treatments.*

The prevalence of obesity in children, adolescents, and adults has increased over the last two decades. Data from the most recent National Health and Nutrition Examination Survey (NHANES III) indicate that approximately 14% of children and 12% of adolescents are overweight as defined by criteria of body mass index (BMI) greater than or equal to the 95th percentile. The rates for some ethnic groups are even higher. For example, approximately 17% of Mexican American children and 16% of African American children are overweight. When the 85th percentile BMI is used as a cutoff, the rates of over-

weight increase to approximately 22% of children and adolescents (Troiano, Flegal, Kuczamarski, Campbell, & Johnson, 1995). The continued rise in the prevalence of obesity occurs despite the fact that decreasing the rates of obesity in children and adolescents has been identified as a national health care priority (Healthy People 2000; NHHS, 1991). Pediatric obesity clearly represents a significant child health problem, affecting a significant portion of the population.

An extensive literature addresses both the consequences and treatment of obesity in adults. Numerous studies document the multiple health risks associated with adult obesity. For example, obese adults are at increased risk for hypertension (Witte-

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man et al., 1989), coronary heart disease (Manson et al., 1990), noninsulin-dependent diabetes mellitus (Lundgren, Bengtsson, Blohme, Lapidus, & Sjoström, 1989), gallstones (Pi-Sunyer, 1993), and premature death (Manson et al., 1995). Obesity treatment is recommended to decrease these physical risk factors in adults. Treatment protocols for adults typically include behavioral modification of food intake and physical activity. Dietary restriction may include reduced calorie intake or specialized diets such as protein sparing fasts, followed by re-introduction to solid foods. Medications such as phentermine, fenfluramine, dexfenfluramine, and more recently sibutramine, have also been used. Fenfluramine and dexfenfluramine were withdrawn from use in 1997 due to concerns with valvular heart disease.

Extensive literature also covers treatment outcomes with overweight adults. During the last decade, researchers in obesity treatment have debated the efficacy of weight loss programs for adults, noting the low rates of maintenance (Garner & Wooley, 1991). In fact, the refractory nature of adult obesity leads some to question whether attempting treatment with overweight adults is a worthwhile endeavor (Garner & Wooley, 1991). Others (Brownell and Rodin, 1994) have challenged this perspective, noting some long-term efficacy. Investigators have begun to identify and document the characteristics of adults in the general population who have successfully maintained weight loss (e.g., Kayman, Bruvold, & Stern, 1990). While there are adults who are able to achieve and maintain weight loss, it seems safe to conclude that losing weight is a challenging and often unsuccessful endeavor for obese adults.

The difficulty of weight loss in adulthood highlights the importance of managing weight during childhood and adolescence. Obesity in childhood and adolescence is predictive of overweight status in adulthood (Charney, Chamblee-Goodman, McBride, Lyon, & Pratt, 1976; Guo, Roche, Chumlea, Gardner, & Siervogel, 1994). A recent longitudinal study (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997) demonstrated that while parental weight is a key factor in predicting whether overweight toddlers will become overweight adults, the child's own weight has more predictive value for adult obesity as he or she becomes older (i.e. ≥ 10 years of age). In addition to predicting adult obesity, pediatric obesity is associated with a number of other negative health consequences. A relationship has been found between body fatness in children and

adolescents, as assessed by triceps and subscapular skinfold thickness, and cardiovascular risk factors of elevated blood pressure, total cholesterol, and serum lipoprotein ratios (Berenson, Srinivasan, Wattigney, & Harsha, 1993; Williams et al., 1992). Obesity during adolescence also appears to pose a risk factor for health status in adulthood regardless of adult weight. A longitudinal study following overweight adolescents into adulthood showed that there was increased morbidity and mortality in adulthood associated with adolescent obesity independent of adult weight status (Must, Jacques, Dallal, Bajema, & Dietz, 1992). Weight loss in childhood may reduce the risk of adult obesity and has been related to improvement in cardiovascular risk factors (Epstein, Kuller, Wing, Valsoki, & McCurley, 1989), suggesting the importance of intervention with this population.

The potential psychosocial consequences of pediatric obesity are a second source of risk (Must, 1996). While general comparisons of obese to non-obese samples on measures of overall psychological function do not provide consistent results, clearly some domains of function are negatively affected by overweight status and particular subsamples of overweight individuals are at increased risk for psychosocial distress (Friedman & Brownell, 1995). Overweight children and adolescents appear to be at risk for negative self-perceptions, body image disturbance, and difficulty with peer relationships.

In a study assessing the impact of parental and child weight and parent psychological status on child functioning, approximately 20% of obese boys and 13% of obese girls were found to have difficulty in social situations as reflected by elevated scores on the Social Problem subscale of the Child Behavior Checklist (CBCL) (Epstein, Klein, & Wisniewski, 1994). In a related study, close to half of a sample of children presenting for weight loss treatment were found to have elevations on at least one clinical scale of the CBCL, with 45% of boys and 28% of girls exhibiting elevated scores on the Social Problem subscale (Epstein, Myers, & Anderson, 1996). In a study assessing the impact of child psychopathology on weight loss treatment, 11% of children were found to have difficulties with social situations (Epstein, Wisniewski, & Weng, 1994). Parental reports of obese children's social difficulties is consistent with behavioral observation of peer interactions, in which overweight adolescents were found to disperse and be the target of more negative interactions than normal weight adolescents

(Baum & Forehand, 1984). While there is some variability across these samples in the rates with which social problems are reported, the overall prevalence is relatively high.

Another domain of psychosocial function that has been evaluated with overweight children is self-esteem and body image. Braet, Mervielde, and Vandereycken (1997) found that groups of treatment-seeking and nontreatment-seeking obese children had more negative physical self-perception and overall self-worth than their nonobese peers. Other studies have not found diminished general self-esteem in obese children and the overall findings in this area are mixed (Friedman & Brownell, 1995).

Adolescence is also associated with psychosocial consequences related to obesity. The transition into puberty is a critical time for the development of body image, placing adolescents at high risk for concerns with shape and weight. Stiegel-Moore, Silberstein, and Rodin (1986) note that adolescence is a particularly challenging time for girls due to the simultaneous pressure to be thin and the increase in body fat related to puberty. Overweight during adolescence has been related to concerns about shape and eating for girls (Friedman, Wilfley, Pike, Stiegel-Moore, & Rodin, 1995) as well as diminished self-esteem for both boys and girls (French, Story, & Perry, 1995). Obese adolescent girls have been found to be more dissatisfied with their weight and body than nonobese girls (Wadden, Foster, Stunkard, & Linowitz, 1989). Some data suggest that adults who have been overweight through childhood and adolescence do not experience the same improvement in body image following weight loss as those who become overweight as adults (Brownell, 1984).

Overweight during adolescence has also been associated with economic outcomes in adulthood. A prospective study found that women who were overweight as older adolescents were less likely to be married, had less education, and lower household income than women who had not been overweight at 7-year follow-up (Gortmaker, Must, Perrin, Sobol, & Dietz, 1993). Men who were overweight as adolescents were less likely to be married. These results were independent of baseline education and aptitude, thus highlighting the critical role of weight on subsequent psychosocial outcome.

The physical and psychosocial difficulties associated with pediatric obesity and the risk for continued obesity into adulthood indicate the importance

of effective weight management intervention for children and adolescents. The purpose of this article is to review the existing literature on intervention with pediatric obesity, with the objective of identifying effective treatment strategies and areas for further research. The focus of the review is on interventions involving modification of diet and activity conducted within a clinical research setting. A more extensive review of the pediatric obesity treatment literature, including school-based treatments, as well as pharmacological and surgical interventions, is provided in a recent review by Epstein, Myers, Raynor, and Saelens (1998). Effective interventions will be defined in accordance with the criteria outlined by Chambless (Task Force on Promotion and Dissemination of Psychological Procedures, 1995).

Method

Study Selection

Published studies assessing treatment of obesity for children or adolescents were considered for inclusion. Relevant studies were found through searches of computerized databases (i.e., Medline and Psychlit) and manual searches of bibliographies and pertinent journals. The bibliography of a recent meta-analysis of obesity treatment for children (Haddock, Shadish, Klesges, & Stein, 1994) was reviewed for all relevant studies. Criteria for inclusion in the review included studies with children or adolescents that targeted weight loss as a primary objective or reported information through quantitative or illustrative presentation regarding weight loss if other outcomes were of primary interest. Included studies were conducted in outpatient clinics or inpatient settings. Studies involving pediatric obesity that were excluded from review were (1) conducted primarily within the school setting, (2) conducted with special populations, such as those with chronic illness or developmental disability, (3) used medication trials for weight loss, or (4) included participants older than 18 years of age as part of the sample. Based on these criteria for inclusion and exclusion, a total of 61 studies were included for review. Due to the number of randomized treatment trials available, we decided to include only randomized outcome studies ($N = 42$) for critical review. If the published methodology did not provide a clear description of the process of group assignment (e.g., randomized versus nonrandomized), an attempt

was made to contact the first author to clarify the method used. Studies for which clarification could not be obtained were assumed to be randomized and are thus noted in Appendix 1. The nonrandomized studies ($N = 19$) are presented in Appendix 2.

Summarizing the Literature

Each of the randomized studies reviewed is summarized in Appendix 1. Each entry includes the citation for the study, information regarding participant sample size and age range, information regarding study inclusion/exclusion criteria, the experimental design of the study, relevant treatment components, and weight loss data at initial outcome and follow-up. Where available, outcome data are reported in terms of changes in percent overweight rather than amount of weight, as this is a more sensitive measure of weight status in children who may still be growing. Categories included in Appendix 1 were critical for summarizing the literature with respect to the Chambless criteria for determining treatment efficacy (Task Force on Promotion and Dissemination of Psychological Procedures, 1995). Because the efficacy of interventions appears to differ by age of the sample studied, we classified studies according to three age categories: children (≤ 13 years), adolescence (12–18 years), and mixed group (studies that included both children and adolescents or did not provide the specific age range of the sample). The age overlap between these categories from 12 years, 0 months to 12 years, 12 months reflects the fact that 12-year-olds were frequently represented in studies of both child and adolescent obesity treatment.

The Chambless criteria do not provide specific guidelines with regard to the duration of treatment effects. The issue of treatment durability is a critical dimension in the pediatric obesity literature. From a clinical perspective, maintenance of weight loss is a central concern. Additionally, several published studies document follow-up as long as 10 years. The framework for defining long-term follow-up in the treatment of pediatric obesity may reasonably be set with reference to the standard in the literature. In light of these considerations, we will outline our results and conclusions with regard to treatments effective in the short and long term. For the purposes of our discussion, long term will be defined as more than 2 years from the end of treatment.

Results

Children

Our review of these studies indicates that a number of independent research groups have documented short-term efficacy of comprehensive behavior modification programs targeting weight control behaviors in children 12 years and younger. Specifically, a series of studies has documented that behavior modification of eating and physical activity behaviors are superior to education alone (Epstein, Wing, Steranchak, Dickson, & Michelson, 1980) and to wait-list control (Aragona, Cassady, & Drabman, 1975; Epstein, Wing, Koeske, & Valoski, 1984) in the short-term treatment of pediatric obesity. Israel and colleagues have also demonstrated the short-term efficacy of behavioral weight reduction compared to a waitlist control (Israel, Stolmaker, & Andrian, 1985; Israel, Stolmaker, Sharp, Silverman, & Simon, 1984). Most studies document short-term decreases of approximately 5%–20% in percent overweight. A second generation of studies compares the efficacy of various “active” treatment modalities in decreasing pediatric obesity. These studies provide information regarding the particular components of treatment that may be most efficacious.

Long-term efficacy of pediatric obesity treatment has been documented by Epstein and colleagues. Children treated in four studies of family-based behavioral treatment were evaluated at 5- and 10-year follow-up periods. At 10-year follow-up, 30% of children treated across the four treatment interventions had achieved nonobese status (Epstein, Valoski, Wing, & McCurley, 1994). The specific treatment conditions that demonstrated superior outcome included children targeted for weight loss along with their parents (follow-up of Epstein, Wing, Koeske, Andrasik, & Ossip, 1981) and diet combined with lifestyle or aerobic activity (follow-up of Epstein, Wing, Koeske, & Valoski, 1985). In particular, children whose parents were also targeted for weight loss demonstrated an approximate decrease of 12% overweight at 5 years and 15% decrease at 10 years. Children who received diet and lifestyle activity intervention maintained a decrease of 12% overweight at 5 years and a decrease of 20% overweight at 10 years (Epstein, McCurley, Wing, & Valoski, 1990; Epstein, Valoski, Wing, & McCurley, 1994).

Findings are mixed regarding defining the spe-

cific treatment parameters that lead to short- and long-term weight loss. A number of studies describe use of common behavior modification components, including self-monitoring of diet and activity, stimulus control strategies, and contingency management. Although some studies have specifically manipulated these components, there does not appear to be enough data to determine which specific behavior modification components or comprehensive package of such components is more successful than others for weight loss.

Aside from specific behavior modification components, other factors that have received consideration in pediatric obesity treatment include parental involvement or emphasis on parent or child control of modification of eating and physical activity habits. There appears to be a continuum of parent involvement, ranging from no involvement to involvement in a "helper" or "facilitator" role, to that of targeting specific parenting or parental weight-related behaviors for intervention. Studies that have manipulated parent involvement in treatment have found comparable short-term outcomes regardless of whether a child participated alone or with a parent (Kingsley & Shapiro, 1977, Kirschenbaum, Harris, & Tomarken, 1984). While studies do not document clear advantages to including parents in treatment or training them in particular management strategies, the interventions documenting the largest and longest-term decreases in percent overweight (i.e., Epstein and colleagues) include parent participation as an integral treatment component.

Parent training is a frequently included component of treatment, although studies comparing emphasis on parental control and child control of behavior have not demonstrated significant differences in outcome. Israel, Guile, Baker, and Silverman (1994) found no differences in short-term outcome or long-term follow-up between groups that included parent training but differed in emphasis on parent control or child self-control of behaviors. Similarly, Epstein, Wing, Koeske, and Valoski (1986) found that whether treatment involved parental control training or child self-control training did not affect short- or long-term outcomes. Targeting parent weight loss is another specific intervention that has been conducted. Addressing child and parent weight loss was not superior to targeting child weight loss alone (Epstein et al., 1981) or to the parent serving as a helper for child weight loss (Israel et al., 1984) in the short term. However, at 5- and 10-year follow-up, tar-

geting both child and parent weight loss was superior to a nonspecific target (Epstein, McCurley et al., 1990; Epstein, Valoski, Wing, & McCurley, 1994). Although not statistically significant, targeting both parent and child weight also resulted in greater decreases in percent overweight for the child than targeting child weight alone (-12.6% vs. +.4% at 5 years and -15.3% vs. -3% at 10 years). It may be that the critical component of parental involvement is that parents serve as a model for their children with regard to eating and activity patterns. This may help to explain the long-term success of children when parents are targeted for weight loss, even though parents eventually regain weight.

Another dimension that has been manipulated in pediatric obesity trials is that of exercise intervention. There is currently little evidence to suggest that exercise intervention independent of dietary changes will result in decreases in children's percent overweight (Blomquist, Borjeson, Larsson, Persso, & Sterky, 1965). There were no significant differences between an intervention involving diet combined with exercise (programmed or lifestyle) versus exercise alone (programmed or lifestyle) at initial outcome (Epstein, Wing, Koeske, Ossip, & Beck, 1982). However, at 11-month follow-up, the groups that participated in lifestyle exercise alone or in combination with diet outperformed the programmed exercise group alone or with diet. Adding an exercise component or manipulating the schedule for exercise did not improve short-term weight loss above and beyond diet alone in groups with children and adolescents (Rocchini et al., 1988; Rocchini, Katch, Schork, & Kelch, 1987). Epstein, Wing, Penner, and Kress (1985) found a greater initial decrease in percent overweight for a program involving diet combined with exercise; however, this difference was not maintained at 12-month follow-up. In a subsequent comparison of diet combined with different types of exercise intervention, diet and lifestyle exercise was superior to diet combined with aerobic exercise or calisthenics at 1-year and superior to diet and calisthenics at 5-year follow-up (Epstein, McCurley et al., 1990). At 10-year follow-up, the diet and lifestyle group and the diet and aerobic exercise group were superior to the diet and calisthenics group (Epstein, Valoski, Wing, & McCurley, 1994). Taken together, these findings suggest that interventions that include a dietary and caloric expenditure component have documented long-term efficacy.

Adolescence

Overall, the treatment literature targeting adolescents is not as well developed as that for children. Based on our review, there does not appear to be a rigorously conducted study documenting that outpatient obesity treatment is superior to wait-list control or instruction only for 12- to 18-year-olds. Using a comprehensive behavior program, Brownell and colleagues (1983) found that adolescent and parent participation separately were superior to adolescent alone or adolescent and parent together, but these group differences were not replicated in a nonwhite sample (Wadden et al., 1990). Coates, Jeffery, Slinkard, Killen, and Danaher (1982) and a study based on the SHAPEDOWN program (Mellin, Slinkard, & Irwin, 1987) have demonstrated short-term decreases in percent overweight across time, however one treatment condition was not found to be superior to another. Coates, Killen, and Slinkard (1982) did not find differences in outcome between adolescent participation alone or with parents in a separate group, both demonstrating a decrease of approximately 8% overweight. Inpatient interventions involving caloric restrictions without clearly articulated behavioral modification components have documented significant weight losses pre- to posttreatment. However, these are nonrandomized studies (see Appendix 2) that do not include comparison samples and only one of these studies provides data on intermediate follow-up (Stallings, Archibald, Pencharz, Harrison, & Bell, 1988).

Conclusions

The criteria for “well-established treatments” as defined by the Chambless criteria (1995) include (1) a minimum of two well-designed between-group studies demonstrating the efficacy of a particular treatment when compared to psychological placebo or alternative treatment or (2) equivalent to an already established treatment; (3) inclusion of treatment manuals; (4) clear definition of sample characteristics; and (5) treatment effects must be demonstrated by at least two different investigators. The Society of Pediatric Psychology (SPP) has modified these criteria so that manualized treatments are not necessary to document efficacy.

Based on the criteria outlined by Chambless, our conclusion is that there are well-established treatments for intervening with pediatric obesity in chil-

dren between the ages of 8 and 12 years with no comorbid medical or psychological concerns or treatments. Specifically, a series of studies has documented that comprehensive behavioral treatment targeting eating and physical activity is superior to wait-list control or nutrition education alone in achieving short-term weight loss in children. Furthermore, four studies by Epstein and colleagues document maintenance of treatment efficacy at long-term follow-up. The series of studies by Epstein and colleagues includes children between 20% and 100% overweight. Although upper weight percentile is not reported as an inclusion/exclusion criteria in the studies conducted by Israel and colleagues (1985), the range of percent overweight in a study comparing treatment to wait-list control was 20% to 99%.

In summary, effective intervention is available for psychologically and medically healthy children who are not superobese. While the majority of participants do not achieve nonobese status, there is documentation of long-term decreases in degree of overweight. Such decreases in percent overweight and prevention of increased obesity into adulthood are likely related to significant improvements in health status. There is currently minimal documentation of treatment efficacy for children who present with comorbid psychopathology or are greater than 100% overweight.

For adolescent treatment, it is our impression that there are “promising interventions” as defined by the SPP modification of Chambless criteria. Promising interventions have been defined as those that meet one of the following three conditions: (1) at least one well-controlled study and another less rigorously controlled study by a separate investigator; (2) two or more well-controlled studies with small numbers or (3) two or more well-controlled studies by the same investigator. Specifically, there are at least one well-controlled study (Brownell, Kelman, & Stunkard, 1983) and a less rigorously controlled study by a separate investigator (Mellin et al., 1987) demonstrating short-term treatment efficacy. While the specific interventions provided by these investigators are not equivalent, they appear to overlap in the inclusion of behavioral modification of diet, and consequently constitute a promising intervention. Overall, it is clear that the literature on weight loss intervention with overweight adolescents is less developed than that with children.

Based on our summary of the existing literature,

we offer several recommendations about future research directions. In childhood treatment, investigators can continue to address specific manipulations of behavioral treatment components and their relationship to outcome. It is our impression that the most successful interventions for pediatric obesity minimize the "cost" associated with adherence. For example, interventions that seem to minimize the inconvenience of energy expenditure (i.e., lifestyle exercise programs and programs targeting reductions in sedentary activity) tend to have greater weight loss success than those programs with more traditional programmed exercise components. It may be that these programs are more successful due to their longevity secondary to their ease of implementation and adherence. Alternatively, there could be an interaction between lifestyle exercise programs and the dietary component of treatment that contributes to lower calorie intake. For example, decreasing sedentary behavior may simultaneously serve to increase physical activity while decreasing caloric intake.

Of great importance is continued work on long-term follow-up and identification of factors that promote maintenance of weight loss. This program of research has been pursued by very few investigators and is a critical issue for weight loss treatments across the age span. In adolescent intervention, well-designed studies are needed comparing treatment to placebos/instruction only and to alternative treatments. It is also important to focus on outcomes other than weight in considering the benefits of weight loss programs. We focused on changes in percent overweight and weight loss, as these are related to morbidity. However, it is important to consider psychosocial outcomes such as quality of life, as well as physiological outcomes associated with weight loss interventions (Drotar, 1997).

Appendix 1

Children \leq 13 years

Amador, M., Ramonths, L. T., Morono, M., & Hermelo, M. P. (1990). Growth rate reduction during energy restriction in obese adolescents. *Experimental and Clinical Endocrinology*, 96, 73–82.

Sample. $N = 94$ ($N = 78$ completed 1 year). Age: 10.6–12.9 years.

Diagnostic criteria. 1) No endocrine or metabolic disease. 2) No weight loss plan in last 6 months. 3) No medication impacting metabolism. 4) Weight-for-height >97 th percentile for Cuban standards. 5) Tricep and subscapular skinfold >90 th percentile. 6) Energy/protein index >90 th percentile. 7) Body fat $>25\%$ in males and 30% in females. 8) Tanner Stage 2.

Experimental design. Randomized group.

Treatment protocol. Weekly sessions for first month, then monthly for up to 3 months with nutrition information and an exercise plan. 1) Caloric intake of 0.25 MJ/kg of expected body weight for height. 2) Caloric intake of 0.17 MJ/kg of expected body weight for height.

Outcome. Four weeks from pre-treatment. Males: 1) -3.2 kg; 2) -3.1 kg. Females: 1) -2.9 kg; 2) -3.0 kg. Six months from pre-treatment. Males: 1) -4.5 kg; 2) -7.6 kg. 2 $>$ 1. Females: 1) -4.3 kg; 2) -9.7 kg. 2 $>$ 1.

Follow-up. Twelve months from pre-treatment. Males: 1) -2.2 kg; 2) -5.5 kg. 2 $>$ 1. Females: 1) -2.2 kg; 2) -8.1 kg. 2 $>$ 1.

Aragona, J., Cassady, J., & Drabman, R. S. (1975). Treating overweight children through parental training and contingency contracting. *Journal of Applied Behavioral Analysis*, 8, 269–278.

Sample. $N = 15$ girls ($N = 12$ completed treatment). Age: 5–10 years.

Diagnostic criteria. 1) Physician and parent referral for weight loss. 2) Child not receiving medical, psychological, or psychiatric treatment and not in another weight control program.

Experimental design. Randomized group, with 2-week baseline.

Treatment protocol. Twelve weekly sessions. Parent-only sessions; information about exercise, calisthenics, nutrition, stimulus control. 1) Response cost and reinforcement. 2) Response cost. 3) Wait-list control.

Outcome. 1) -11.3 lbs. 2) -9.5 lbs. 3) $+9$ lbs. 1, 2 $>$ 3.

Follow-up. Eight weeks from post-treatment: 1) -7.9 lbs. 2) -5.0 lbs. 3) $+3.6$ lbs. 1 $>$ 3. Thirty-one weeks from post-treatment: 1) -0.7 lbs. 2) $+7.3$ lbs.

Blomquist, B., Borjeson, M., Larsson, Y., Persson, B., & Sterky, G. (1965). The effect of physical activity on the body measurements and work capacity of overweight boys. *Acta Paediatrica Scandinavica*, 54, 566–572.

Sample. $N = 43$ ($N = 41$ completed treatment). Age: 8–9 years.

Diagnostic criteria. 1) Child weight \geq mean weight-for-height plus 2 standard deviations. 2) Child has no medical condition that may interfere with weight control.

Experimental design. Randomized group.

Treatment protocol. 1) Physical activity 2 \times a week for 4 months. 2) No treatment control.

Outcome. 1) +0.8 kg. 2) +0.8 kg.

Follow-up. None.

Duffy, G., & Spence, S. H. (1993). The effectiveness of cognitive self-management as an adjunct to a behavioral intervention for childhood obesity: A research note. *Journal of Child Psychology and Psychiatry*, 34, 1043–1050.

Sample. $N = 21$ ($N = 17$ at 6 months). Average percent overweight = 48.36%. Age: 7–13 years.

Diagnostic criteria. None.

Experimental design. Randomized group.

Treatment protocol. Eight weekly, 90-minute group sessions. Two groups: 7–10-year-olds; 10–13-year-olds. Traffic Light Diet administered. 1) Stimulus control, monitoring of food and activity, goal-setting and positive reinforcement, relaxation training. 2) Same as (1), without relaxation training, but with cognitive restructuring, problem-solving, self-reinforcement.

Outcome. 1) –9.1% OV¹ 2) –7.8% OV. Significant ($p < .05$) decrease in percentage of overweight individuals in both groups. 1 = 2.

Follow-up. Three months (change from pre-treatment: 1) –8.7% OV; 2) –7.0% OV; 1 = 2. Six months (change pre-treatment): 1) –9.2% OV; 2) –8.9% OV; 1 = 2.

¹OV = overweight.

Epstein, L. H., McKenzie, S. J., Valoski, A., Klein, K. R., & Wing, R. R. (1994). Effects of mastery criteria and contingent reinforcement for family-based child weight control. *Addictive Behaviors*, 19, 135–145.

Sample. $N = 44$ ($N = 39$ at follow-up). Age: 8–12 years ($M = 10.2$ years). Seventy-four percent of subjects were female.

Diagnostic criteria. 1) Child 20–100% overweight. 2) No parent >100% overweight. 3) Neither child nor parent receiving psychological/psychiatric treatment. 4) No family history of eating disorders. 5) Parent available to participate in treatment.

Experimental design. Randomized group.

Treatment protocol. Twenty-six weekly meetings, followed by 6 monthly meetings. Traffic Light Diet; lifestyle exercise; parents trained in behavior management; parents and children seen in separate groups. 1) Mastery-based; progressed after material mastery. 2) Yoked control for progress of material presentation.

Outcome. Six months from pre-treatment: 1) –30.1% OV; 2) –20% OV. 1 > 2. Twelve months from pre-treatment: 1) –26.5% OV; 2) –16.7% OV. 1 > 2.

Follow-up. Twenty-four months from pre-treatment: 1) –15.4% OV; 2) –10.6% OV. 1 = 2.

Epstein, L. H., Valoski, A., Vara, L., McCurley, J., Wisniewski, L., Kalarchian, M. A., Klein, K. R., & Shrager, L. R. (1995). Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychology*, 14, 109–115.

Sample. $N = 61$. Age: 8–12 years.

Diagnostic criteria. 1) Child 20–100% overweight. 2) Neither child nor parent has an existing psychological/psychiatric condition. 3) No medical conditions interfering with exercise. 4) No involvement in other weight loss program. 5) Parent available to participate in treatment.

Experimental design. Randomized group.

Treatment protocol. Weekly session for 4 months, then 2 monthly meetings. Traffic Light Diet; behavioral contracting. 1) Reinforce decreased sedentary

activity; 2) reinforced increased physical activity; and 3) combined 1 and 2.

Outcome. Four months from pre-treatment: 1) approx. -21% OV; 2) approx. -13% OV; 3) approx. -17% OV. 1 > 2.

Follow-up. Twelve months from pre-treatment: 1) approx. -19% OV; 2) approx. -8% OV; 3) approx. -11% OV. 1 > 2, 3.

Epstein, L. H., Wing, R. R., Koeske, R., Andrasik, F., & Ossip, D. J. (1981). Child and parent weight loss in family-based behavior modification programs. *Journal of Consulting and Clinical Psychology, 49*, 674-685.

Sample. $N = 76$ ($N = 62$ completed treatment; $N = 55$ at follow-up). Age: 6-12 years.

Diagnostic criteria. 1) Child and parent 15-80% overweight. 2) Triceps skinfold >95 percentile for age. 3) Height at least 25th percentile for age. 4) Child not receiving psychological/psychiatric treatment. 5) Intact family. 6) Target parent able to participate in weight loss plan and attend most sessions.

Experimental design. Randomized group after stratification on age and the child's and parent's percent-age overweight.

Treatment protocol. 14 sessions (8 weekly sessions, followed by 6 monthly sessions). Traffic Light Diet; aerobic exercise plan; behavior modification. 1) Parent and child targeted for weight loss. 2) Child targeted for weight loss. 3) Nonspecific target.

Outcome. Significant ($p < .05$) decrease in percentage of obesity for all groups. 1 = 2 = 3. Forty-one percent of children were less than 20% overweight. 2 > 3.

Follow-up. Thirteen months after post-treatment: significant ($p < .05$) decrease in obesity from pre-treatment for all groups; 27% of children were less than 20% overweight. Five years from pre-treatment: 1) -12.6% OV; 2) +.4% OV; 3) +7.8% OV. 1 > 3. Ten years from pre-treatment: 1) -15.3% OV; 2) approx. -3% OV; 3) +7.6% OV. 1 > 3.

Epstein, L. H., Wing, R. R., Koeske, R., Ossip, D., & Beck, S. (1982). A comparison of life-style change and programmed aerobic exercise on weight and fitness changes in obese children. *Behavior Therapy, 13*, 651-665.

Sample. $N = 51$ ($N = 42$ complete treatment; $N = 38$ at follow-up). Age: 8-12 years.

Diagnostic criteria. 1) Child 20%-80% overweight. 2) Child having no existing psychological/psychiatric condition. 3) Parent available for treatment.

Experimental design. Randomized group.

Treatment protocol. Eight weekly sessions, then 5 maintenance sessions over 4 months. Traffic Light Diet; parents and children seen in separate groups; behavior modification; behavioral contracting. 1) Diet and lifestyle exercise. 2) Diet and programmed exercise. 3) Lifestyle exercise. 4) Programmed exercise.

Outcome. At the end of maintenance: 1) -19% OV; 2) -10% OV; 3) -13% OV; 4) -14% OV. 1 = 2 = 3 = 4.

Follow-up. Eleven months from post-treatment (change from pre-treatment: 1) -14% OV; 2) -0% OV; 3) -11% OV; 4) -10% OV. 1 + 3 > 2 + 4.

Epstein, L. H., Wing, R. R., Koeske, R., & Valoski, A. (1984). Effects of diet plus exercise on weight change in parents and children. *Journal of Consulting and Clinical Psychology, 52*, 429-437.

Sample. $N = 53$ children and their parents ($N = 47$ completed treatment). Age: 8-12 years.

Diagnostic criteria. 1) Child and parent 20-80% overweight. 2) Child and parent with triceps skinfold > 85th percentile. 3) Child not receiving psychological/psychiatric treatment. 4) Parent availability. 5) No contra-indications for exercise.

Experimental design. Randomized group.

Treatment protocol. Eight weekly sessions, then 7 sessions over 20 weeks. Traffic Light Diet; parents and children in separate groups; token economy. 1) Diet. 2) Diet & lifestyle exercise. 3) Waitlist control.

Outcome. 1) Approx. -15% OV. 2) approx. -16% OV. 3) approx. +2% OV. 1 = 2 > 3.

Follow-up. Six months from post-treatment: significant ($p < .05$) decrease in percent overweight from pre-treatment for groups 1 and 2. Five years from pre-treatment: 1) -1.8% OV; 2) -6.8% OV. Ten years from pre-treatment: 1) -10% OV; 2) -8.4% OV.

Epstein, L. H., Wing, R. R., Koeske, R., & Valoski, A. (1985). A comparison of lifestyle exercise, aerobic exercise, and calisthenics on weight loss in obese children. *Behavior Therapy, 16*, 345-356.

Sample. $N = 44$ ($N = 35$ completed treatment). Age: 8-12 years.

Diagnostic criteria. 1) Child and parent >20% overweight. 2) Child and parent able to participate in regular exercise.

Experimental design. Randomized group.

Treatment protocol. Eight weekly sessions, then 10 monthly sessions. Traffic Light Diet; self-monitoring; modeling; parent behavioral management; behavioral contracting. 1) Diet and programmed aerobic exercise. 2) Diet and lifestyle exercise. 3) Diet and calisthenics exercise.

Outcome. Two months from pre-treatment: 1) -11% OV; 2) -13% OV; 3) -11% OV. Six months from pre-treatment: 1) -17% OV; 2) -20% OV; 3) -20% OV. Twelve months from pre-treatment: 1) -16% OV; 2) -16% OV; 3) -18% OV. Significant ($p < .05$) decreases in percent overweight for all groups at 2, 6, and 12 months. $1 = 2 = 3$.

Follow-up. One year from post-treatment (change from pre-treatment: 1) -7% OV; 2) -18% OV; 3) -7% OV. $2 > 1, 3$. Five years from pre-treatment: 1) -6.2% OV; 2) -12% OV; 3) +6.5% OV. $2 > 3$. Ten years from pretreatment: 1) -10.9% OV; 2) -19.7% OV; 3) +12.2% OV. $1, 2 > 3$.

Epstein, L. H., Wing, R. R., Koeske, R., & Valoski, A. (1986). Effects of parent weight on weight loss in obese children. *Journal of Consulting and Clinical Psychology, 54*, 400-401.

Sample. $N = 41$. Age: 8-12 years.

Diagnostic criteria. 1) Child 20-80% overweight. 2) Triceps skinfolds >85th percentile. 3) Child not receiving psychological/psychiatric treatment.

Experimental design. Randomized group crossed with parent overweight status (yes/no).

Treatment protocol. Eight weekly sessions, then 10 monthly meetings. Parents and children seen in separate groups; Traffic Light Diet; lifestyle exercise program. 1) Parent control training, parent overweight. 2) Child self-control training, parent over-

weight. 3) Parent control training, parent not overweight. 4) Child self-control training, parent not overweight.

Outcome. No differential effect of parent vs. child control: (1 + 2) -7.7% OV; (3 + 4) -16.3% OV. $3 + 4 > 1 + 2$.

Follow-up. Three years from pre-treatment: (1 + 2) -0.9% OV; (3 + 4) -5.6% OV. No significant ($p < .05$) changes from pre-treatment. $1 + 2 = 3 + 4$.

Epstein, L. H., Wing, R. R., Penner, B. C., & Kress, M. J. (1985). The effect of diet and controlled exercise on weight loss in obese children. *Journal of Pediatrics, 107*, 358-361.

Sample. $N = 23$. Age: 8-12 years. Females only.

Diagnostic criteria. 1) Child >20% overweight. 2) No contra-indications for exercise. 3) Parent available for participation.

Experimental design. Randomized group after stratification on age, percent overweight, and physical work capacity.

Treatment protocol. Eight weekly sessions, then 10 monthly maintenance sessions. Traffic Light Diet; parents and children seen in separate groups; behavior management. 1) Diet and aerobic exercise (exercise on site). 2) Diet alone.

Outcome. Two months from pre-treatment: 1) -17% OV; 2) -12% OV. Six months from pre-treatment: 1) -28% OV; 2) -19% OV. $1 > 2$. Twelve months from pre-treatment: 1) -25% OV; 2) -19% OV.

Follow-up. None.

Epstein, L. H., Wing, R. R., Steranchak, L., Dickson, B., & Michelson, J. (1980). Comparison of family-based behavior modification and nutrition education for childhood obesity. *Journal of Pediatric Psychology, 5*, 25-36.

Sample. $N = 13$. Age: 6-12 years.

Diagnostic criteria. 1) Child >20% overweight. 2) Child not receiving medical, psychological/psychiatric treatment.

Experimental design. Randomized groups after stratification by percent overweight and age.

Treatment protocol. Seven weekly groups, then 3 monthly group sessions. Traffic Light Diet; Exercise instruction and calisthenics or walking in sessions. 1) Self-monitoring, stimulus control, behavioral contracting, therapist phone contact. 2) Nutrition and exercise education only.

Outcome. Percent overweight: 1) -9.7% ; 2) -4.7% . $1 > 2$.

Follow-up. Three months from post-treatment (change from pre-treatment [percent overweight]): 1) -17.5% ; 2) -6.4% . $1 > 2$.

Epstein, L. H., Wing, R. R., Valoski, A., & Gooding, W. (1987). Stability of food preferences during weight control: A study with 8- to 12- year-old children and their parents. *Behavior Modification, 11, 87-101.*

Sample. $N = 41$. Age: 8–12 years.

Diagnostic criteria. 1) Child 20–80% overweight. 2) Triceps skinfolds >85 th percentile. 3) Child not receiving psychological/psychiatric treatment.

Experimental design. Randomized groups crossed with parent overweight status (yes/no).

Treatment protocol. Eight weekly sessions, then 10 monthly sessions. Traffic Light Diet; parents and children seen in separate groups; behavior modification; 1200 kcal/day diet. 1) Parent control training, with parent overweight. 2) Child self-control training, with parent overweight. 3) Parent control training, with parent not overweight. 4) Child self-control training, with parent not overweight.

Outcome. No differential effect of parent vs. child control: (1 + 2) approx. -8% OV; (3 + 4) approx. -18% OV. $3 + 4 > 1 + 2$.

Follow-up. Three years from pre-treatment: (1 + 2) approx. -0.1% OV; (3 + 4) approx. -9% OV. Five years from pre-treatment: (1 + 2) $+1.9\%$ OV; (3 + 4) -7.3% OV. Ten years from pre-treatment: (1 + 2) $+3.1\%$ OV; (3 + 4) -11% OV.

Epstein, L. H., Wing, R. R., Valoski, A., & Penner, B. C. (1987). Stability of food preferences during weight control. *Behavior Modification, 11, 87-101.*

Sample. $N = 16$. Age: 8–12 years ($M = 9.8$ years).

Diagnostic criteria. Child $\geq 20\%$ overweight.

Experimental design. Randomized group.

Treatment protocol. Eight weekly sessions, followed by 4 monthly sessions. Parents and children seen in separate groups; Traffic Light Diet; exercise information; behavioral contracting. 1) Noncontingent unfamiliar foods. 2) Contingent unfamiliar foods.

Outcome. Two months: (1 + 2) -8.6% OV. Six months: (1 + 2) -19.6% OV. Significant ($p < .05$) decrease in percent overweight for groups. $1 = 2$.

Follow-up. None.

Epstein, L. H., Wing, R. R., Woodall, K., Penner, B. C., Kress, M. J., & Koeske, R. (1985). Effects of family-based behavioral treatment on obese 5- to 8- year-old children. *Behavior Therapy, 16, 205-212.*

Sample. $N = 19$. Age: 5–8 years.

Diagnostic criteria. Obese girls referred by school nurse or physician.

Experimental design. Randomized group.

Treatment protocol. Intensive 5-week camp, then 9 monthly maintenance sessions. Traffic Light Diet; parents and children seen in separate groups. 1) Behavioral management and diet and exercise program. 2) Diet and exercise program.

Outcome. Four months from pre-treatment: 1) -20% OV; 2) -13% OV. Eight months from pre-treatment: 1) -24% OV; 2) -12% OV. $1 > 2$.

Follow-up. One year from post-treatment (change from pre-treatment: 1) -26% OV; 2) -11% OV. $1 > 2$.

Epstein, L. H., Woodall, K., Goreczny, A. J., Wing, R. R., & Robertson, R. J. (1984). The modification of activity patterns and energy expenditure in obese young girls. *Behavior Therapy, 15, 101-108.*

Sample. $N = 19$. Age: 5–8 years.

Diagnostic criteria. 1) Child 20–80% overweight. 2) No existing medical, psychological, or psychiatric condition that may interfere with weight control.

Experimental design. Randomized group.

Treatment protocol. Five weeks of 2 days/week of camp. Traffic Light Diet; nutrition education;

maternal attendance at sessions. 1) Experimental: baseline, treatment, reversal, treatment, reversal. 2) Control: baseline; treatment = random reinforcement of physical activity; reversal = reinforcement of sharing.

Outcome. Pre-post change: -4.9 lbs. across groups. 1 = 2.

Follow-up. None.

Flodmark, C., Ohlsson, T., Ryden, O., & Sveger, T. (1993). Prevention of progression to severe obesity in a group of obese schoolchildren treated with family therapy. *Pediatrics*, 91, 880-884.

Sample. $N = 41$ ($N = 39$ for 1 and 2 at follow-up; $N = 48$ for 3). Age: 10-11 years.

Diagnostic criteria. 1) Child body mass index (BMI) > 23 .

Experimental design. Randomized to two treatment groups with nonrandom assignment to the no treatment control.

Treatment protocol. Fourteen to eighteen months. Exercise encouraged. 1) Dietary counseling by dietitian (for ~ half of group) and 5 pediatrician visits over 18 months. 2) One plus 6 family therapy sessions over 1-year period. 3) Retrospective chart review.

Outcome. 1) +0.6 BMI. 2) +0.3 BMI. 2 $>$ 1. No comparison to 3 available.

Follow-up. Two years from pre-treatment (change from pre-treatment): 1) +1.6 BMI; 2) +1.1BMI; 3) +2.8BMI. 2 $>$ 3.

Graves, T., Meyers, A. W., & Clark, L. (1988). An evaluation of parental problem-solving training in the behavioral treatment of childhood obesity. *Journal of Consulting and Clinical Psychology*, 56, 246-250.

Sample. $N = 40$ ($N = 39$ completed treatment; $N = 31$ at 6 months). Age: 6-12 years ($M = 9.3$ years).

Diagnostic criteria. 1) Child $\geq 20\%$ overweight. 2) Child does not have a medical condition that may interfere with weight control. 3) No involvement in other weight loss programs. 4) Parent available to participate in treatment.

Experimental design. Random group assignment after stratification on percent overweight.

Treatment protocol. Eight weekly sessions, then sessions at 1, 2, 3, and 6 months. Parents and children seen together in same group. 1) Behavior modification. 2) Problem-solving. 3) Instruction only.

Outcome. Eight weeks from pre-treatment: 1) -8.6% OV; 2) -13.5% OV; 3) -4.7% OV. 2 $>$ 1, 3. Three months from pre-treatment: 1) -13.1% OV; 2) -24.3% OV; 3) -10.3% OV. 2 $>$ 1, 3. Six months from pre-treatment: 1) -10.2% OV; 2) -24.5% OV; 3) -9.5% OV. 2 $>$ 1, 3.

Follow-up. None.

Israel, A. C., Guile, C. A., Baker, J. E., & Silverman, W. K. (1994). An evaluation of enhanced self-regulation training in the treatment of childhood obesity. *Journal of Pediatric Psychology*, 19, 737-749.

Sample. $N = 20$. Average percent overweight = 46.9%. Age: 8 years, 11 months-13 years, 0 months.

Diagnostic criteria. 1) Child $> 20\%$ overweight. 2) Child does not have a medical condition that may interfere with weight control and has no existing psychological/psychiatric conditions.

Experimental design. Randomized group.

Treatment protocol. Eight 90-minute group sessions, then 9 biweekly sessions. Parent and child seen in separate groups. 1) Monitoring, cue control, rewarding weight control behaviors, parent-control emphasis. 2) Same as (1), except child-control emphasis; child self-management training (e.g. self goal-setting, self-reward).

Outcome. 1) -12.5% OV. 2) -15.6% OV. Significant ($p < .05$) decrease from pre-treatment in both groups. 1 = 2.

Follow-up. One year from pre-treatment: 1) -0.79% OV; 2) -5.78% OV. 1 = 2. Three years from pre-treatment: 1) +6.36% OV; 2) -4.81% OV. 1 = 2.

Israel, A. C., Stollmaker, L., & Andrian, C. A. G. (1985). The effects of training parents in general child management skills on a behavioral weight loss program for children. *Behavior Therapy*, 16, 169-180.

Sample. $N = 30$ ($N = 27$ at 9 weeks; $N = 20$ at 1 year). Age: 8-12 years ($M = 11$ years, 4 months).

Diagnostic criteria. 1) Child $\geq 20\%$ overweight. 2) Medical clearance from physician.

Experimental design. Random assignment to group after stratification on percent overweight and age.

Treatment protocol. Nine weekly, 90-minute sessions. Brief sessions at 1, 2, 4, 6, 9, and 12 months after treatment. Parents and children seen in separate groups; discussion and homework about cue control, activity, intake, rewards. 1) Behavioral weight reduction and parent training; received 2 extra sessions focused on parent training. 2) Behavioral weight reduction. 3) Waitlist control.

Outcome. Nine weeks from pre-treatment: 1) -7.2% OV; 2) -11.6% OV; 3) -0.9% OV. $2 > 1 > 3$. One year from pre-treatment: 1) -10.2% OV (no change from post-treatment); 2) -1.3% OV (significant [$p < .05$] increase from post-treatment).

Follow-up. None.

Israel, A. C., Stolmaker, L., Sharp, J. P., Silverman, W. K., & Simon, L. G. (1984). An evaluation of two methods of parental involvement in treating obese children. *Behavior Therapy, 15*, 266-272.

Sample. $N = 69$ ($N = 53$ completed treatment; $N = 10$ on waitlist; $N = 44$ at 1 year). Range (percent overweight) = 20-99%. Age: 8-12 years ($M = 10$ years, 6 months).

Diagnostic criteria. 1) Child $\geq 20\%$ overweight.

Experimental design. Randomized to treatment or control. Parents self-selected to helper role or self weight loss between session 4 and 5.

Treatment protocol. Nine weekly, 90-minute sessions, with phone contacts between sessions. Brief sessions at 1, 2, 4, 6, 9, and 12 Months. Parents and children in separate groups; discussion and homework about cue control, activity, intake, rewards. 1) Parent weight-loss. 2) Parent-helper. 3) Waitlist control.

Outcome. Nine weeks from pre-treatment: 1) -8.8% OV; 2) -9.2% OV; 3) $+0.4\%$ OV. $1, 2 > 3$. One year from pre-treatment: 1) -4% OV; 2) -3.8% OV. Controls offered treatment.

Follow-up. None.

Kingsley, R. G., & Shapiro, J. (1977). A comparison of three behavioral programs for

the control of obesity in children. *Behavior Therapy, 8*, 30-36.

Sample. $N = 40$. Age: 10-11 years.

Diagnostic criteria. 1) Child in >90 th percentile weight for age. 2) Mother available to participate in treatment. 3) Child does not have a medical condition that may interfere with weight control and is not currently receiving psychological/psychiatric treatment. 4) No involvement in other weight program.

Experimental design. Randomized group balanced for sex, mean age, and pre-treatment weight.

Treatment protocol. Eight weekly sessions. 1) Child participates alone. 2) Mother and child participate. 3) Mother participates alone. 4) Waitlist control.

Outcome. 1) -3.4 lbs. 2) -3.6 lbs. 3) -3.6 lbs. 4) $+2.0$ lbs. $1, 2, 3 > 4$.

Follow-up. Six weeks from post-treatment (change from pre-treatment): 1) -1.4 lbs.; 2) -3.4 lbs.; 3) $-.8$ lbs. $1 = 2 = 3$.

Kirschenbaum, D. S., Harris, E. S., & Tomarken, A. J. (1984). Effects of parental involvement in behavioral weight loss therapy for preadolescents. *Behavior Therapy, 15*, 485-500.

Sample. $N = 30$. Age: 9-13 years.

Diagnostic criteria. 1) Child $>20\%$ overweight. 2) Physician permission. 3) Child not currently receiving psychological/psychiatric treatment.

Experimental design. Randomized group after matching on parent and child sex, child age, and parent and child percent overweight.

Treatment protocol. Nine weekly, 90-minute group sessions. Self-monitoring; nutrition education; stimulus control; cognitive strategies. 1) Parent participated with child. 2) Child attended alone. 3) Waitlist control.

Outcome. 1) -6.3% OV. 2) -7.1% OV. 3) $+0.6\%$ OV. $1 = 2 > 3$.

Follow-up. Three months from pre-treatment: 1) -4.7% OV; 2) -7.7% OV; 3) $+4.0\%$ OV. $1 = 2 > 3$. One year from pre-treatment: 1) -7.6% OV; 2) -6.2% OV.

Senediak, S., & Spence, S. H. (1985). Rapid versus gradual scheduling of therapeutic

contact in a family-based behavioral weight control program for children. *Behavioral Psychotherapy*, 13, 265–287.

Sample. $N = 35$. Average percent overweight = 37.2%. Age: 6–12.5 years.

Diagnostic criteria. 1) Child >20% overweight.

Experimental design. Randomized group.

Treatment protocol. 1) Eight group sessions, twice weekly for 4 weeks. 2) Eight group sessions over 15 weeks (1–4 weekly, 5–6 biweekly, 7–8 three weeks apart). Groups 1 and 2 received: Traffic Light Diet; self-monitoring of eating and exercise; behavioral contracting; stimulus control. 3) Eight group sessions, twice weekly for 4 weeks (relaxation training; will-power training). 4) Four-week waiting list.

Outcome. Four weeks from pre-treatment: 1) –5.3% OV; 2) –4.2% OV; 3) –1.4% OV; 4) +2.4% OV. 1 = 2 > 3, 4. Fifteen weeks from pre-treatment: 1) –11.5%; 2) –13.5% OV; 3) –3.5% OV. 1 = 2 > 3.

Follow-up. Twenty-six weeks from pre-treatment: 1) –13.0% OV; 2) –19.2% OV; 3) –5.9% OV. 1 = 2 > 3.

Wheeler, M. E., & Hess, K. W. (1976). Treatment of juvenile obesity by successive approximation control of eating. *Journal of Behavioral Therapy and Experimental Psychiatry*, 7, 235–241.

Sample. $N = 40$. ($N = 14$ treatment; $N = 14$ control; $N = 12$ drop out). Age: 2–11 years ($M = 7.1$ years).

Diagnostic criteria. 1) Obese as defined by pediatrician. 2) Child has no medical, psychological, or psychiatric condition that would interfere with a weight control program. 3) Skinfold thickness that was 1–9 SD above the mean for their age, sex, and race.

Experimental design. Random assignment, but “preference given to treatment condition for first child referred in each category under study.” Matched pairs retrospectively for data analysis.

Treatment protocol. Mother-child dyads seen for 30 minutes on biweekly basis (treatment duration not standardized). 1) Treatment. 2) Waitlist.

Outcome. “Last date point” 1) –4.1% OV; 2) +6.3% OV. 1 > 2.

Adolescents (12–18 years.)

Brownell, K. D., Kelman, J. H., & Stunkard, A. J. (1983). Treatment of obese children with and without their mothers: Changes in weight and blood pressure. *Pediatrics*, 71, 515–523.

Sample. $N = 38$ ($N = 36$ at 1 year). Average percent overweight = 55.7%. Age: 12–16 years.

Diagnostic criteria. 1) Adolescent not currently receiving medical treatment or having a medical condition that would interfere with a weight control program. 2) Adolescent $\geq 20\%$ overweight.

Experimental design. Randomized group after stratifying by percent overweight.

Treatment protocol. Forty-five-to sixty-minute group sessions for 1 year (16 weekly sessions, then 1 session every 2 months). Nutrition education; reward for attendance and weight loss; stimulus control; behavior modification. 1) Adolescent in treatment alone. 2) Adolescent and mother attended together. 3) Adolescent and mother attended separately.

Outcome. 1) –6.8% OV. 2) –7.0% OV. 3) –17.1% OV. 3 > 1 = 2.

Follow-up. One year from pre-treatment: 1) –6.0% OV; 2) –5.5% OV; 3) –20.5% OV. 3 > 1 = 2.

Coates, T. J., Jeffery, R. W., Slinkard, L. A., Killen, J. D., & Danaher, B. G. (1982). Frequency of contact and monetary reward in weight loss, lipid change, and blood pressure reduction with adolescents. *Behavior Therapy*, 13, 175–185.

Sample. $N = 42$ ($N = 36$ completed treatment; $N = 32$ at 6 months). Average weight = 179.1 lbs. Average percent overweight = 40.6%. Age: 13–17 years.

Diagnostic criteria. 1) Child >10% overweight.

Experimental design. Randomized group after blocking by percent overweight.

Treatment protocol. Ten weekly, 1-hour group sessions. Role-play; nutrition education; calorie restriction; monitor food and activity. 1) Money for weight loss and 1 \times per week contact. 2) Money for weight loss and 5 \times per week contact. 3) Money for calorie goals and 1 \times per week contact. 4) Money for calorie goals and 5 \times per week contact.

Outcome. 1) -5.2% OV. 2) -12.0% OV. 3) -5.0% OV. 4) -6.2% OV. Only (2) had significant ($p < .05$) decrease in percent overweight.

Follow-up. Six months from post-treatment (change from pre-treatment): 1) +10.4% OV; 2) -8.0% OV; 3) +5.8% OV; 4) -2.4% OV. Only (2) had significant ($p < .05$) decrease from pre-treatment in percent overweight.

Coates, T. J., Killen, J. D., & Slinkard, L. A. (1982). Parent participation in a treatment program for overweight adolescents. *International Journal of Eating Disorders, 1*, 37-48.

Sample. $N = 31$. Age: 13-17 years.

Diagnostic criteria. 1) Child >10% overweight.

Experimental design. Randomized group after stratified on percent overweight.

Treatment protocol. Twenty predominantly group sessions. Daily weigh-ins; monetary reward for weight loss; calorie restriction; physical activity education. 1) Parent participation in separate class. 2) No parent participation.

Outcome. 1) -8.6% OV. 2) -5.1% OV. 1 = 2.

Follow-up. Nine months (change from pre-treatment): 1) -8.4% OV; 2) -8.2% OV.

Emes, C., Velde, B., Moreau, M., Murdoch, D. D., & Trussell, R. (1990). An activity based weight control program. *Adapted Physical Activity Quarterly, 7*, 314-324.

Sample. $N = 33$ ($N = 25$ completed treatment). Range (percent overweight) = 20-96%. Age: 12-15 years.

Diagnostic criteria. 1) Adolescent >20% overweight. 2) Adolescent is not currently receiving medical treatment nor possesses any medical, psychological, or psychiatric condition that would interfere with a weight control program.

Experimental design. Randomized group.

Treatment protocol. Five group sessions each week for 12 weeks. Nutrition education; behavior management. 1) Five times per week exercise sessions for first 3 weeks, and gradual decrease to 3x per week within 9 weeks. 2) One exercise session per week for the first 3 weeks, and gradual increase to 3x per week within 9 weeks. 3) Counseling and discussion about leisure activities.

Outcome. 1) -8.7% OV. 2) -17.2% OV. 3) -6.4% OV. Significant ($p < .05$) decrease in percent overweight for all groups. 1 = 2 = 3.

Follow-up. None.

Ikeda, J. P., Fujii, M., Fong, K. A., & Hanson, M. (1982). Two approaches to adolescent weight loss. *Journal of Nutritional Education, 14*, 90-92.

Sample. $N = 50$ ($N = 27$ completed treatment; $N = 24$ at follow-up). Average percent overweight = 27.4%. Age: 14-16 years. Asian adolescents.

Diagnostic criteria. None.

Experimental design. Randomized group.

Treatment protocol. Fourteen weekly, 90-minute group sessions (relaxation training; physical activity; nutrition education). 1) Behavior change. 2) Behavior change plus energy restriction.

Outcome. 1) -2.2% OV. 2) -1.1% OV. 1 = 2.

Follow-up. Twelve months after post-treatment (change from post-treatment): 1) +2.3% OV; 2) -0.5% OV. 1 = 2.

Mellin, L. M., Slinkard, L. A., & Irwin, C. E. (1987). Adolescent obesity intervention: Validation of the SHAPEDOWN program. *Journal of the American Dietetic Association, 87*, 333-338.

Sample. $N = 66$. Average percent overweight = 33.4% (range = 13-113%). Age: 12-18 years.

Diagnostic criteria. None.

Experimental design. Pre-post with a treatment and control group; groups not statistically compared.

Treatment protocol. Fourteen weekly, 90-minute group sessions. 1) SHAPEDOWN program; two parent sessions; on-site exercise; leader-facilitated interactions about weight control behaviors. 2) Waitlist control.

Outcome. 1) -5.9% OV. 2) -0.3% OV. Significant ($p < .05$) decrease in percent overweight for (1) but not (2).

Follow-up. Six months from pre-treatment: 1) -6.2% OV; 2) -5.2% OV. Significant ($p < .05$) decrease in percent overweight in both groups. Fifteen months from pre-treatment: 1) -9.9% OV; 2) -0.1% OV. Significant ($p < .05$) decrease in percent overweight for (1) only.

Wadden, T. A., Stunkard, A. J., Rich, L., Rubin, C. J., Sweidel, G., & McKinney, S. (1990). Obesity in black adolescent girls: A controlled clinical trial of treatment by diet, behavior modification, and parental support. *Pediatrics, 85*, 345–352.

Sample. $N = 36$. Average BMI = 35.2. Average weight = 94.9 kg. Age: 12–16 years. Black females.

Diagnostic criteria. 1) Adolescent not currently receiving medical treatment nor possessing a medical condition that would interfere with a weight control program. 2) Adolescent >10 kg. overweight.

Experimental design. Randomized group after blocking on BMI.

Treatment protocol. Sixteen weekly, then 6 monthly 1-hour group sessions (caloric restriction; nutrition education; stimulus control; reward for attendance and weight loss; behavior modification). 1) Adolescent alone. 2) Adolescent and mother attended together. 3) Adolescent and mother attended separately.

Outcome. 1) –1.6 kg. 2) –3.7 kg. 3) –3.6 kg. Average: –1.3 BMI. Significant ($p < .05$) decrease in percent overweight in all groups. 1 = 2 = 3.

Follow-up. Six months. (after treatment?) ($N = 31$). 1) +4.6 kg. 2) +5.4 kg. 3) +7.1 kg. Average: +1.5 BMI. No significant ($p < .05$) change from pre-treatment. 1 = 2 = 3.

Mixed Age ≤ 18 years

Becque, M. D., Katch, V. L., Rocchini, A. P., Marks, C. R., & Moorehead, C. (1988). Coronary risk incidence of obese adolescents: Reduction by exercise plus diet intervention. *Pediatrics, 81*, 605–612.

Sample. $N = 36$. Average weight = 71.1 kg. Mean age = 12.8 years.

Diagnostic criteria. 1) Child >75th percentile body weight and triceps skinfold.

Experimental design. Randomized group.

Treatment protocol. Twenty weeks. 1) No contact control. 2) Twenty weekly 1-hour sessions (caloric restriction; self monitoring; stimulus control; reinforcing weight control behaviors). 3) (2) plus a 3 \times per week exercise program.

Outcome. 1) +3.2 kg. 2) –1.6 kg. 3) –0.4 kg. 1 = 2 = 3.

Follow-up. None.

Figuroa-Colon, R., von Almen, T. K., Franklin, F. A., Schuftan, C., & Suskind, R. M. (1993). Comparison of two hypocaloric diets in obese children. *American Journal of Diseases in Children, 147*, 160–166.

Sample. $N = 19$ ($N = 11$ at 14.5 months). Average percent overweight = 80.4%. Age: 7.5–16.9 years.

Diagnostic criteria. 1) Child >40% overweight.

Experimental Design. Randomized group [?].

Treatment protocol. Ten outpatient sessions, followed by monthly sessions for 1 year (parents and children seen separately; physical activity program; behavior modification). 1) Protein-sparing modified fast; 2520–3360J/day; 50% protein, 40% fat, 10% carbohydrates. 2) Hypocaloric diet; 3360–4200J/day; 20% protein, 30% fat, 50% carbohydrates. After 10 weeks, both on 4200J balanced diet that increased to 5040J after 3 months.

Outcome. Ten weeks from pre-treatment: 1) –29.5% OV; 2) –13.8% OV. 1 > 2. Five and one-half months from pre-treatment: 1) –32.2% OV; 2) –17.5% OV. 1 > 2.

Follow-up. Fourteen and one-half months from pre-treatment: 1) –23.3% OV; 2) –20.3% OV. 1 = 2.

Hills, A. P., & Parker, A. W. (1988). Obesity management via diet and exercise intervention. *Child Care, Health and Development, 14*, 409–416.

Sample. $N = 20$. Age: prepubertal.

Diagnostic criteria. 1) Child >95th percentile for percent overweight. 2) Child BMI >25.

Experimental design. Randomized group.

Treatment protocol. Food recording; dietitian consult; nutrition education; parents encouraged to attend. 1) Sixteen weekly, 50-minute exercise sessions (reinforcement and monitoring of home exercise; prescription of 20 minutes of exercise 3–4 \times per week). 2) No exercise.

Outcome. 1) –5.5 kg. 2) +2.6 kg. No significant ($p < .05$) change in either group.

Follow-up. None.

Johnson, W. G., Hinkle, L. K., Carr, R. E., Anderson, D. A., Lemmon, C. R., Engler, L. B., & Bergeron, K. C. (1997). Dietary and exercise interventions for juvenile obesity: Long-term effect of behavioral and public health models. *Obesity Research, 5*, 257-261.

Sample. $N = 32$. ($N = 28$ completed treatment; $N = 18$ at 5 year follow-up). Age: 8-17 years.

Diagnostic criteria. 1) Child >20% overweight. 2) Child has no medical, psychological, or psychiatric condition that would interfere with a weight control program.

Experimental design. Randomized group.

Treatment protocol. Sixteen weekly, 90-minute group sessions (parents and children attended together). 1) Nutrition and behavior change education. 2 and 3) Subjects received modified Traffic Light Diet and gradual exercise program over 7 weeks: 2) nutrition and eating habit change, then exercise; 3) exercise, then nutritional and eating habit change.

Outcome. 1) +.3 kg. 2) -2.3 kg. 3) -1.0 kg. 2,3>1 (in BMI).

Follow-up. Five-year phone follow-up after pre-treatment: 1) -11.3% OV; 2) -31.5% OV; 3) -15.2% OV. 2 = 3 > 1 (in absolute weight).

Mendonca, P. J., & Brehm, S. S. (1983). Effects of choice on behavioral treatment of overweight children. *Journal of Social and Clinical Psychology, 1*, 343-358.

Sample. $N = 20$ ($N = 15$ completed treatment; $N = 11$ at 6-month follow-up). Average percent overweight = 48.3%. Age: 8-15 years, 3 months ($M = 11$ years, 1 month).

Diagnostic criteria. 1) Child >10% overweight.

Experimental design. Randomized group.

Treatment protocol. Eight weekly, 90-minute group sessions (parents and children seen together; behavior modification). 1) Perceived choice of weight control program. 2) No perceived choice of weight control program. *Participants actually received the same program.

Outcome. 1) -6.4 lbs. 2) -4.1 lbs. 1 > 2.

Follow-up. Twelve weeks from pre-treatment: 1) -7.6 lbs.; 2) -4.3 lbs. Six months from pre-treatment: 1) -1.0 lbs.; 2) +5.8 lbs. 1 = 2.

Pena, M., Bacallao, J., Barta, L., Amador, M., & Johnston, F. E. (1989). Fiber and exercise in the treatment of obese adolescents. *Journal of Adolescent Health Care, 10*, 30-34.

Sample. $N = 80$. Age: 10-14.9 years.

Diagnostic criteria. 1) Child percentage of body fat > 25% in boys and >30% in girls. 2) Child has no medical condition that would interfere with weight control program.

Experimental design. Randomized group matched by sex [?].

Treatment protocol. Four week inpatient (caloric restriction). 1) High fiber, high exercise. 2) Low fiber, high exercise. 3) High fiber, no exercise. 4) Low fiber, no exercise. High fiber = 20 ± 5 fiber/day; high exercise = two 20-minute sessions per day, 5 days per week.

Outcome. 1 > 3, 4. (absolute weight in girls). 1 > 4 (absolute weight in boys).

Follow-up. None.

Rocchini, A. P., Katch, V., Anderson, J., Hinderliter, J., Becque, D., Martin, M., & Marks, C. (1988). Blood pressure in obese adolescents: Effect of weight loss. *Pediatrics, 82*, 16-23.

Sample. $N = 72$ ($N = 63$ completed treatment). Age: 10-17 years.

Diagnostic criteria. 1) Child in >75th percentile weight-for-height. 2) Child in >80th percentile triceps and subscapular skinfolds.

Experimental design. Randomized group.

Treatment protocol. Twenty weekly, 1-hour group sessions. 1) Modified caloric exchange program; stimulus control; self-monitoring; reinforcement. 2) Same as (1) plus 1-hour exercise class 3x per week. 3) No treatment control.

Outcome. 1) -2.5 kg. 2) -2.5 kg. 3) +4.0 kg. 1 = 2 > 3.

Follow-up. None.

Rocchini, A. P., Katch, V., Schork, A., & Kelch, R. P. (1987). Insulin and blood pressure during weight loss in obese adolescents. *Hypertension, 10*, 267-273.

Sample. $N = 50$. Age: 10-16 years.

Diagnostic criteria. 1) Child in >75th percentile overweight. 2) Child in >80th percentile triceps and subscapular skinfolds.

Experimental design. Randomized group.

Treatment protocol. Twenty weekly, 1-hour sessions. 1) Caloric exchange program (self-monitoring; stimulus control; reinforcement for weight control behavior). 2) Same as (1), plus 1-hour exercise session 3× per week. 3) Waitlist control.

Outcome. 1) -2.1 kg. 2) -2.8 kg. 3) +3.8 kg. 1 = 2 > 3.

Follow-up. None.

Weiss, A. R. (1977). A behavioral approach to the treatment of adolescent obesity. *Behavior Therapy, 8, 720-726.*

Sample. $N = 46$. Range (percent overweight) = 1-104%. Average % overweight = 42.6%. Age: 9.5-18 years.

Diagnostic criteria. None.

Experimental design. Randomized group matched on age, weight, percent overweight, and gender.

Treatment protocol. Twelve individual 10-15 minute weekly sessions. 1) No contact. 2) Exchange diet with no rewards. 3) Exchange diet with rewards. 4) Stimulus control (e.g., eating only in one room) with rewards for those behaviors. 5) Combination of 3 and 4.

Outcome. 1) +1.0% OV. 2) -3.2% OV. 3) -5.2% OV. 4) -5.5% OV. 5) -6.9% OV. 3 = 4 = 5 > 1.

Follow-up. Fifty-one weeks after pre-treatment: 1) +7.4% OV; 2) +2.8% OV; 3) -0.1% OV; 4) -10.5% OV; 5) -9.0% OV. 4, 5 > 1, 2.

Appendix 2: Nonrandomized Treatment Studies

Children ≥ 13 years

Davis, K., Christoffel, K., Vespa, H., Pierleoni, M. P., & Papanastassiou, R. (1993). Obesity in preschool and school-age children. *Annals of New York Academy of Sciences, 699, 262-264.*

Sample. Total $N = 93$ (preschool = 26; school age = 67). Age: 1-10 yrs.

Diagnostic criteria. 1) Child >20% overweight. 2) Attended at least 2 sessions in a year.

Experimental design. Retrospective chart review.

Treatment protocol. Nutrition evaluation clinic.

Outcome. Preschool children: 2-3 visits (-4.5% OV); ≥ 4 visits (-12.5% OV). School age children: 2-3 visits (-2.0% OV); ≥ 4 visits (-5.8% OV).

Follow-up. None.

Epstein, L. H., Valoski, A., Koeske, R., & Wing, R. R. (1986). Family-based behavioral weight control in obese young children. *Journal of the American Dietetic Association, 86, 481-484.*

Sample. $N = 17$. Age: 14-70 mos ($M = 4.09$ years). Average percent overweight = 42.1%.

Diagnostic criteria. None.

Experimental design. Pre-post.

Treatment protocol. Ten weekly meetings, then 10 monthly meetings (parents and children seen in separate groups; Traffic Light Diet; exercise; behavior management).

Outcome. Six months from pre-treatment (significant change, $p < .05$): -19.8% OV. Twelve months from pre-treatment (significant change, $p < .05$): -18.1% OV.

Follow-up. Twenty-four months from pre-treatment (significant change, $p < .05$): -14.3% OV.

Israel, A. C., Solotar, L. C., & Zimand, E. (1990). An investigation of two parental involvement roles in the treatment of obese children. *International Journal of Eating Disorders, 9, 557-564.*

Sample. $N = 40$ ($N = 35$ at 1 year). Age: 9 years, 5 months-13 years, 7 months.

Diagnostic criteria. 1) Child >20% overweight. 2) Medical release. 3) Child currently not receiving psychological/psychiatric treatment.

Experimental design. Non randomized group (parental choice).

Treatment protocol. Eight weekly, 90-minute group sessions, then 6 sessions over the next 18 weeks (monitoring; reinforcement for weight control be-

haviors). 1) Parent with concurrent weight loss program/plan. 2) Parent engaged in helper role with no self weight loss program/plan.

Outcome. 1) -11.1% OV. 2) -9.7% OV. Significant ($p < .05$) decrease from pre-treatment in both groups. 1 = 2.

Follow-up. One year from pre-treatment: 1) -4.1% OV; 2) -4.4% OV. Significant ($p < .05$) decrease from pre-treatment in both groups. 1 = 2.

Adolescents (12–18 years)

Archibald, E. H., Harrison, J. E., & Pencharz, P. B. (1983). Effect of a weight-reducing high-protein diet on the body composition of obese adolescents. *American Journal of Diseases of Children, 137, 658–662.*

Sample. $N = 17$. Average percent overweight = 58%. Age: 12.5–17.4 years.

Diagnostic criteria. 1) No medications that would interfere with weight loss.

Experimental design. Pre-post; 4-day baseline.

Treatment protocol. Three-week inpatient, then outpatient sessions every 2 weeks (total of 3 months). Protein-sparing modified fast with mineral supplements; regular progressive exercise.

Outcome. -13.2 kg. -15.2% of initial weight.

Follow-up. None.

Coates, T. J., & Thoresen, C. E. (1981). Behavior and weight changes in three obese adolescents. *Behavior Therapy, 12, 383–399.*

Sample. $N = 3$. Average percent overweight = 90.9%. Age: 15–16 years.

Diagnostic criteria. 1) Child does not have a medical condition that would interfere with a weight control program nor is the child currently receiving medical treatment.

Experimental design. Time-series single subject design.

Treatment protocol. Twenty biweekly, 1-hour sessions, 3–5× family meetings in home. Self-monitoring; stimulus control; nutrition education; contracting. S1 and S2 = intervention subjects. S3 = knowledge and contact control.

Outcome. S1) -20 lbs., -16.9% OV. S2) -11.5 lbs., -10.5% OV. S3) +5 lbs.

Follow-up. None.

Dietz, W. H., & Schoeller, D. A. (1982). Optimal dietary therapy for obese adolescents: Comparison of protein plus glucose and protein plus fat. *Journal of Pediatrics, 100, 638–644.*

Sample. $N = 9$. Age: 12–17 years. Tanner stage II–IV.

Diagnostic criteria. None.

Experimental design. Crossover design with alternating order of isocaloric diets. Baseline of 2 weeks balanced diet for weight maintenance.

Treatment protocol. One-month inpatient dietary program. 1) Protein-sparing hypocaloric diet made isocaloric with glucose. 2) Protein-sparing hypocaloric diet made isocaloric with fat.

Outcome. 1) -6.4 kg. 2) -7.4 kg. 1 = 2.

Follow-up. None.

Endo, H., Takagi, Y., Nozue, T., Kuwahata, K., Uemasu, f., & Kobayashi, A. (1992). Beneficial effects of dietary intervention on serum lipid and apolipoprotein levels in obese children. *American Journal of Diseases of Children, 146, 303–305.*

Sample. $N = 13$. Age: 12–14 years.

Diagnostic criteria. 1) No hypogonadism, short stature, or mental retardation.

Experimental design. Pre-post.

Treatment protocol. Four-week inpatient (caloric restriction: 8400 KJ/day 1st 3 days; 7560 KJ/day next 4 days; decrease 840 KJ/week until reach 5040 KJ/day; exercise 840 KJ/day jogging and muscle training).

Outcome. -8.4 kg.

Follow-up. None.

Fanari, P., Somazzi, R., Nasrawi, F., Ticozzelli, P., Grugni, G., Agosti, R., & Longhini, E. (1993). Haemorheological changes in obese adolescents after short-term diet. *International Journal of Obesity, 17, 487–494.*

Sample. $N = 20$. Age: 12–17 years.

Diagnostic criteria. 1) Adolescent body mass index (BMI) >30. 2) Adolescent BMI >95th percentile.

Experimental design. Pre-post.

Treatment protocol. One-month inpatient (caloric restriction 1000 kcal/day diet [25% protein, 26% fat, 49% carbohydrates]).

Outcome. -4.4 BMI. -19.9% OV. Significant ($p < .05$) decrease in BMI and percent overweight.

Follow-up. None.

Gross, I., Wheeler, M., & Hess, K. (1976). The treatment of obesity in adolescents using behavioral self-control: An evaluation. *Clinical Pediatrics, 15*, 920-924.

Sample. $N = 11$ ($N = 10$ completed treatment). Average percent overweight = 39.2% (range 13.3 = 75.5%). Age: 13-17 years. Black females.

Diagnostic criteria. 1) Physician referral.

Experimental design. Pre-post.

Treatment protocol. Ten weekly, 90-minute group sessions (no direct parent involvement; food self-monitoring; stimulus control; verbal positive reinforcement; nutrition education).

Outcome. -7.4 lbs. -4.7% overweight.

Follow-up. Twelve weeks from post-treatment (change from pre-treatment): -12.5 lbs.; -7.7% OV.

Marshall Hoerr, S. L., Nelson, R. A., & Essex-Sorlie, D. (1988). Treatment and follow-up of obesity in adolescent girls. *Journal of Adolescent Health Care, 9*, 28-37.

Sample. $N = 12$ ($N = 11$ at follow-up). Average percent overweight = 43.4%. Age: 12-15 years. All subjects were female.

Diagnostic criteria. 1) Post menarche. 2) Adolescent $\geq 15\%$ overweight. 3) Adolescent ≥ 70 th percentile for sum of triceps and subscapular skinfolds. 4) Obesity not secondary to a medical condition.

Experimental design. Pre-post.

Treatment protocol. Bi-weekly, 90-minute group sessions for 3 months (SHAPEDOWN program; exercise and food activities; individualized caloric restriction of 1000-1600 kcals/day).

Outcome. -3.1% OV. No significant ($p < .05$) change in percent overweight.

Follow-up. Nine months after post-treatment (change from post-treatment): -8.0% OV. No significant ($p < .05$) change in percent overweight.

Stallings, V. A., Archibald, E. H., Pencharz, P. B., Harrison, J. E., & Bell, L. E. (1988). One-year follow-up of weight, total body potassium, and total body nitrogen in obese adolescents treated with the protein-sparing modified fast. *American Journal of Clinical Nutrition, 48*, 91-94.

Sample. $N = 17$ ($N = 12$ at follow-up). Average percent overweight = 58%. Age: 12.5-17.4 years.

Diagnostic criteria. None.

Experimental design. Pre-post.

Treatment protocol. Three weeks inpatient, then outpatient every other week for 3 months. Protein-sparing modified fast; diet and activity counseling.

Outcome. -29.0% OV.

Follow-up. Twelve months from pre-treatment: -29.0% OV. No change from post-treatment.

Zakus, G., Chin, M. L., Keown, M., Herbert, F., & Held, M. (1979). A group behavior modification approach to adolescent obesity. *Adolescence, 14*, 481-490.

Sample. $N = 10$ ($N = 5$ completed treatment). Average weight = 231 lbs. Average percent overweight = 81.1%. Age: 15-18 years.

Diagnostic criteria. 1) Referred, if interested, from medical adolescent clinic.

Experimental design. Pre-post.

Treatment protocol. Twenty-five weekly, 90-minute group sessions (stimulus control; caloric restriction; food self-monitoring; separate monthly 2-hour "significant other") groups

Outcome. Average loss of 2.1 lbs. during treatment. Average gain of 13.4 lbs. ($N = 4$) during 6 months prior to treatment. Average gain of 8.1 lbs. among 4 dropouts.

Follow-up. None.

Mixed Age < 18 years.

Brown, M. R., Klish, W. J., Hollander, J., Campbell, M. A., & Forbes, G. B. (1983). A

high protein, low calorie liquid diet in the treatment of very obese adolescents: Long-term effect on lean body mass. *American Journal of Clinical Nutrition*, 38, 20–31.

Sample. $N = 8$ ($N = 5$ at 5 months). Average percent overweight = 113%. Age: 11–18 years.

Diagnostic criteria. None.

Experimental design. Pre-post.

Treatment protocol. Five weeks inpatient, then 4 months of biweekly sessions with the last week inpatient (1st 8 days, 1000 kcal diet, then optifast-70 liquid diet [500–700 kcal/day]; inpatient exercise for 1 hour on 5 days/week).

Outcome. Five weeks from pre-treatment: -13.5 kg., -22% OV. Five months from pre-treatment: -30.1 kg., -61% OV.

Follow-up. None.

Hoffman, R. P., Stumbo, P. J. E., Janz, F. K., & Nielsen, D. H. (1995). Altered insulin resistance is associated with increased dietary weight loss in obese children. *Hormone Research*, 44, 17–22.

Sample. $N = 10$. Mean = 10.1 years.

Diagnostic criteria. 1) Child $>20\%$ overweight. 2) Tanner stage <2 .

Experimental design. Pre-post.

Treatment protocol. Eighteen-day inpatient (caloric restriction of 1000 kcal less than required for weight maintenance; camp-type program for recreation).

Outcome. -4.6 kg. -4% OV. Significant ($p < .05$) decrease in absolute weight from pre-treatment.

Follow-up. None.

Nuutinen, O. (1991). Long-term effects of dietary counselling on nutrient intake and weight loss in obese children. *European Journal of Clinical Nutrition*, 45, 287–297.

Sample. $N = 48$. Average percent overweight = 54.6%. Age: 6–16 years.

Diagnostic criteria. 1) Child $>20\%$ overweight.

Experimental design. Non-randomized consecutive assignment.

Treatment protocol. Parents and children seen together in (1) and (2). 1) Monthly physician checks for 1st year and $2\times$ during 2nd year: five 30–60 minute parent and child meetings with nutritionist; caloric restriction; 20% protein, 35% fat, 45% carbohydrates. 2) Monthly physician checks for 1st year and $2\times$ during 2nd year: seven 1-hour separate child and parent group sessions; nutritionist in parents and child group every other session. 3) Monthly school nurse visits during 1st year and $2\times$ during 2nd year: encourage children to change dietary habits.

Outcome. One year from pre-treatment. 1 + 2) -16.2% OV. Significant ($p < .05$) decrease in percent overweight for combination of groups 1 and 2. 3) No significant ($p < .05$) change in percent overweight.

Follow-up. Two years after pre-treatment: 1 + 2) -12.8% OV. Significant ($p < .05$) decrease in percent overweight for combination of groups 1 and 2. 3) -7.3% OV. No significant ($p < .05$) change in percent overweight for group 3.

Reybrouck, T., Vinckx, J., Van den Berghe, G., & Vanderschueren-Lodeweyckx, M. (1990). Exercise therapy and hypocaloric diet in the treatment of obese children and adolescents. *Acta Paediatrica Scandinavia*, 79, 84–89.

Sample. $N = 25$. Range (percent overweight) = 24–104%. Age: 3.9–16.4 year.

Diagnostic criteria. 1) Child with no endocrine disorders.

Experimental design. Pre-post.

Treatment protocol. Treatment duration not standardized. 1) Calories 800–1000 kcal per day. 2) Group 1 plus 250 kcal/day of exercise.

Outcome. Four months from pre-treatment: 1) -15.8% OV; 2) -25.5% OV. $2 > 1$.

Follow-up. Eight months (change from 4 months): 1) -3.5% OV; 2) -4.1% OV. $1 = 2$.

Rohrbacher, R. (1973). Influence of a special camp program for obese boys on weight loss, self-concept, and body image. *The Research Quarterly*, 44, 150–157.

Sample. $N = 204$. Age: 8–18 years.

Diagnostic criteria. 1) Child $>10\%$ overweight.

Experimental design. Pre-post.

Treatment protocol. Eight-week camp program (3 hours per day of physical activity; 1200–1400 kcal/day with high protein; nutrition education).

Outcome. –13.7 kg. Significant ($p < .05$) change in linear trend of weight gain.

Follow-up. Six months from pre-treatment: –11.1 kg.

Suskind, R. M., Sothorn, M. S., Farris, R. P., von Almen, T. K., Schumacher, H., Carlisle, L., Vargas, A., Escobar, O., Loftin, M., Fuchs, G., Brown, R., & Udall, J. N. (1993). Recent advances in the treatment of childhood obesity. *Annals New York Academy of Sciences, 699, 181–199.*

Sample. $N = 50$ at pre-treatment; $N = 37$ at 10 weeks; $N = 20$ at 26 weeks; $N = 7$ at 36 weeks. Age: 7–17 years.

Diagnostic criteria. Stratified into percent overweight categories: $>100\%$; > 50 but $\leq 99\%$, >20 but $\leq 49\%$.

Experimental design. Pre-post.

Treatment protocol. Weekly sessions (behavior modification; exercise program; protein sparing modified fast for 1st 10 weeks: 1200 kcal/day up to 36 weeks). *Exercise and time spent in each diet dependent upon percent overweight classification.

Outcome. Ten weeks from pre-treatment: approx. –19% OV. Twenty-six weeks from pre-treatment: approx. –29% OV. Thirty-six weeks from pre-treatment: approx. –24% OV. 36 weeks = 26 weeks > 10 weeks $>$ pre-treatment.

Follow-up. None.

Wabitsch, M., Braun, U., Heinze, E., Muche, R., Mayer, H., Teller, W., & Fusch, C. (1996). Body composition in 5–18 year-old obese children and adolescents before and after weight reduction as assessed by deuterium dilution and bio-electrical impedance analysis. *American Journal of Clinical Nutrition, 64, 1–6.*

Sample. $N = 146$. Average BMI = 28.8. Age: 5.5–17.8 years ($M = 12.7$ years).

Diagnostic criteria. 1) Child >90 th percentile BMI.

Experimental design. Pre-post.

Treatment protocol. Forty-day inpatient (diet of 4321 ± 523 KJ/day [26% protein, 56% carbohydrates, 18% fat], 1–2 hours per day of physical activity).

Outcome. –7.7 kgs., –3.0 BMI. Significant ($p < .05$) decrease in both absolute weight and BMI.

Follow-up. None.

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