

Treatment of Pediatric Overweight: An Examination of Feasibility and Effectiveness in an Applied Clinical Setting

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Objective To examine the effectiveness and feasibility of an evidence-based treatment for weight loss in children. **Methods** A total of 41 children who were overweight and their families were provided a modified version of the Traffic Light Diet (TLD) in an applied setting. Children who received treatment as usual (TAU) constituted a comparison sample. **Results** Children receiving the modified TLD demonstrated a significantly greater reduction in standardized body mass index (z -BMI) than children receiving TAU. **Conclusions** The TLD is a feasible treatment that can be implemented in applied settings that include samples often excluded from treatment efficacy studies. Results are discussed in the context of bridging the gap between science and service.

Key words applied setting; childhood overweight; effectiveness; Traffic Light Diet.

In the United States, slightly over 17% of all school-aged children are classified as overweight, and the prevalence of overweight has significantly increased over the past four decades (Ogden et al., 2006). In addition to children becoming more overweight, overweight children have consistently been getting heavier (Jolliffe, 2004). Furthermore, more overweight has been seen in children at younger ages over the past two decades (Ogden et al., 2006). This is particularly concerning because of the associated health and psychological consequences (Reilly, 2005). On the basis of this alarming increase, the National Institutes of Health has identified the reduction of overweight in children as a primary goal under its current health initiative, *Healthy People 2010* (U.S. Department of Health and Human Services, 2000).

The greatest empirical support for the treatment of pediatric overweight has been found for behaviorally based therapies. Specifically, Epstein's (1996) "Traffic Light Diet" (TLD) program provides perhaps the best example of an evidence-based therapy for overweight children (Kazdin & Weisz, 1998). In fact, children who

received the TLD have demonstrated a maintenance of effects in 10-year follow-up studies (Epstein, Valoski, Wing, & McCurley, 1990). Despite the abundance of support for the TLD, an outside research team has yet to replicate these results. Furthermore, Kazdin and Weisz (1998) noted that the treatments for pediatric overweight have not been tested in applied clinical settings.

The overarching goal of the current study was to expand the literature on behaviorally based therapies for overweight children, by examining Epstein's TLD in a clinical setting. Several aspects that may differentiate applied settings and analog settings were addressed. First, unlike typical efficacy studies, participants were self-referred or physician-referred clients for treatment. Second, and consistent with clinical practice, participants incurred monetary expenses for provided services. Finally, restrictive inclusion/exclusion criteria which may decrease the generalizability of interventions from research to applied settings were not used (Elliott, 1998). On the basis of the strength of the TLD efficacy literature, we hypothesized that Epstein's TLD would be effective in an applied clinical setting.

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Methods

Participants

TLD Treatment Condition

A total of 51 families attended at least one session of the intervention; however, seven families (13.71%) completed <30% of the program. Another two children were diagnosed with a pervasive developmental delay, and one child did not meet overweight criteria. The above children and their families were excluded from analyses. The children meeting inclusion criteria ($n = 41$) self-identified into the following ethnic/racial categories: Caucasian ($n = 37$, 90%), African American ($n = 2$, 6%), Hispanic ($n = 1$, 2%), and Native American ($n = 1$, 2%). Participants included 18 males and 23 females and were, on average, 12.3 years of age ($SD = 2.60$ years). The average body mass index (BMI) z -score was 2.23 ($SD = 0.34$). Parents of 15 participants (36.59%) reported their child as having a past or current psychological and/or medical condition. The average annual income of families was \$85,000 ($SD = 32,000$) with most families falling within the middle and upper socioeconomic ranges.

Comparison Condition

For a comparison [i.e., treatment as usual (TAU)] condition, anonymous archival data from a cohort of 75 children who had previously completed treatment at the weight loss facility in which the study was conducted were obtained (Table 1). These children received the standard care that was available at the clinic before the authors became involved with the program. A total of 41

participants were matched to children receiving the TLD condition on age, gender, and weight status [i.e., at-risk for overweight, overweight, and very overweight; very overweight was defined as having a BMI >99th percentile, based on Center for Disease Control and Prevention (CDC) normative growth curve data; Ogden et al., 2000]. Unlike the TLD condition, participants in the comparison (TAU) condition received goal-setting sessions only (i.e., they were not provided other behavioral techniques). The total amount of time spent weekly with participants in each condition was the same (i.e., 120 min).

Procedure

After a preliminary investigation indicating the superiority of the behaviorally based intervention to cognitive therapy and TAU (Herrera, Johnston, & Steele, 2004), the present study was designed to specifically test the effectiveness of the TLD relative to the TAU condition. To accomplish this in the clinical setting, we assigned all new referrals in the for-profit clinic to the TLD condition (discussed below). Inclusion criteria included (a) being designated overweight by treatment center staff (i.e., BMI >85th percentile), (b) between the ages of 6 and 18, and (c) having at least one parent willing to attend weekly sessions with the child. Groups consisted of approximately seven children and their parent(s). Parental consent and child assent were obtained before the first weekly session. This study was approved by the Human Subjects Committee (IRB) at the investigators' institution.

Table 1. Characteristics of Children in the Traffic Light Diet (TLD) and Treatment as Usual (TAU) Conditions

| Characteristic | TLD | | TAU | |
|---|---------------|--------------|---------------|--------------|
| | <i>M (SD)</i> | <i>n (%)</i> | <i>M (SD)</i> | <i>n (%)</i> |
| Age (in years) | 11.90 (2.88) | | 11.93 (2.33) | |
| 7–9 | | 10 (24) | | 9 (22) |
| 10–12 | | 16 (39) | | 17 (41) |
| 13–15 | | 7 (17) | | 8 (20) |
| 16–17 | | 8 (20) | | 7 (17) |
| Gender | | | | |
| Male | | 18 (44) | | 18 (44) |
| Female | | 23 (56) | | 23 (56) |
| Pretreatment weight status (z -BMI) | 2.23 (0.34) | | 2.11 (0.38) | |
| At-risk | | 2 (5) | | 3 (7) |
| Overweight | | 20 (49) | | 22 (54) |
| Very overweight | | 19 (46) | | 16 (39) |
| Posttreatment weight status (z -BMI) | 2.14 (0.32) | | 2.09 (0.35) | |
| At-risk | | 4 (10) | | 5 (12) |
| Overweight | | 25 (61) | | 27 (66) |
| Very overweight | | 12 (29) | | 9 (22) |

BMI, body mass index.

Children and their families from both conditions received treatment at a bariatric clinic independent of other medical facilities. The clinic included an exercise facility which families had access to throughout the treatment. The treatment team for this study was multidisciplinary and included a pediatrician, exercise trainers, a dietician, and masters level behavior therapists. This for-profit clinic required families to self-pay ~\$850 for 10 weeks of treatment.

Intervention Components

Children and parents were presented with information to assist with lifestyle changes for their family. The TLD provides an educational program for nutrition and a corresponding physical activity program. The behavioral techniques used (e.g., the use of contracts and social reinforcement, stimulus control, and preplanning) were consistent with those discussed by Epstein and colleagues and were intended to assist parents and children in adopting a healthier lifestyle. Families attended, on average, 80% of weekly sessions ($SD = 11.86\%$).

Nutrition Education

Consistent with the TLD (Epstein, 1996), participants were taught to increase their intake of foods that are low in fat and high in nutrient density (i.e., “green” foods) and to decrease their intake of foods that are high in fat/sugar and low in nutrient density (i.e., “red” foods). Families were also taught to change their food environments by limiting the number of “red” foods and increasing the number of “green” foods in the home (i.e., stimulus control).

Exercise Education

Participants were given information regarding exercise that included increasing caloric expenditure. Additionally, physical trainers assisted in the implementation of lifestyle exercise (e.g., family exercise and sports). Participants were encouraged to increase physical activity through an increase in activities of daily living (e.g., taking the stairs and walking to school). Families were provided with an exercise plan for use at home and received one additional 45-min group training session with the fitness trainers weekly. Families were also taught to reduce sedentary behaviors (e.g., television watching).

Measures

Body Mass Index

Before beginning the program, a physical examination was conducted by a pediatrician affiliated with the bariatric clinic. Participants’ height and weight were collected. Weights were obtained using a digital scale with

participants wearing light clothing and no footwear. Height was measured on wall-mounted stadiometer, with no footwear. BMI standardized (z -BMI) for M and SD (z -BMI = $(BMI - SD)/M$) was calculated using norms from the CDC (Ogden et al., 2000).

Results

At the baseline assessment, the TLD condition and the TAU condition did not differ on z -BMI [$t(80) = 0.92, ns$]. Gender differences in initial percentage over ideal BMI were explored using an independent samples t test to determine possible variables to be covaried in the following analyses. At the initial screening for overweight, males and females did not significantly differ in their initial z -BMI [$t(39) = 1.64, ns$]. However, a Pearson product moment correlation indicated that age was significantly related to z -BMI [$r(82) = .22, p < .05$]. On the basis of these findings, only age was used as a covariate for analyses.

Effectiveness

The following analyses were conducted to test the hypothesis that children who were provided the TLD in an applied setting would demonstrate a significantly greater pre-post change in z -BMI, when compared with a TAU condition. A 2 (condition) \times 2 (time) repeated measures ANCOVA was conducted to compare z -BMI change for the children provided the TLD and the comparison condition (Table I). Results indicated a significant main effect for time [$F(1, 79) = 11.16, p < .01$, Cohen’s $f = .25$], a nonsignificant main effect for condition [$F(1, 79) = .42, ns$, Cohen’s $f = .10$], and a significant interaction effect [$F(1, 79) = 6.15, p < .05$, Cohen’s $f = .28$]. Follow-up examination of the interaction effects (i.e., independent samples t tests of change in z -BMI) indicated that, although children in both conditions demonstrated improvements in z -BMI, children in the TLD condition evidenced significantly greater reduction in BMI than children in the TAU condition [$t(80) = 2.50, p < .05$, Cohen’s $d = .56$].

Discussion

As noted by Kazdin and Weisz (1998), examining the treatment of pediatric overweight in applied clinical settings is critical. Translational research provides evidence for the generalizability of results to other applied settings. The current study provided an examination of the TLD in a sample that is more typical of children and their families who seek treatment in applied clinical settings.

For example, both children who were very overweight and had comorbid conditions were included (37 and 29%, respectively). In addition, participants were self-referred and, unlike many laboratory-based studies, paid for services.

In terms of overall effectiveness, children who were provided a modified version of the TLD significantly decreased their BMI over the course of 10 weeks. This lends specific evidence that the TLD is a feasible treatment in applied settings. In addition to having a statistically significant reduction in weight, a medium effect ($f = .28$) was noted for this weight loss. On average, children reduced their percent over ideal BMI by 8% and reduced their weight by 4%. This reduction is clinically significant because a weight reduction as little as 5–10% has been shown to significantly decrease the likelihood of developing type 2 diabetes and other health problems associated with overweight (de Leiva, 1998). This significant weight loss that approached levels associated with positive health outcomes occurred over the course of only 10 weeks. The goal of the program was to change behaviors that would result in larger reductions in BMI over a longer period. Long-term data for this sample are currently unavailable. However, the weight loss obtained in this study was consistent with the weight loss goals of the TLD during treatment (i.e., between 0.5 and 2 pounds per week; Epstein, Paluch, Kilanowski, & Raynor, 2004).

An important factor to consider in terms of effectiveness is the feasibility of providing an intervention in an applied setting. A specific consideration is the cost of the program. In fact, the main reason for the length of the program was the cost restrictiveness. Whether similar results can be obtained in less-expensive settings remains to be seen. Specific future directions should include examining weight loss programs in more cost-effective settings (e.g., community, family service, and primary care centers). Furthermore, “dismantling studies” that define the contribution of various treatment components remain an important area for future research.

Although children in this study demonstrated significant weight loss, several limitations are worth noting. First, follow-up data are not yet available. This study provided preliminary evidence to the effectiveness of the TLD. However, a demonstration that these children either maintain this weight loss or have a continued decrease in BMI is needed before effectiveness can be completely assessed. On the basis of previous laboratory-based studies, weight reduction maintenance is expected for some participants (Epstein et al., 1990). However, Epstein’s research also suggests a fairly high number of children and families who relapse into overweight. Similarly, a

limitation of treatments for pediatric overweight in general is that the children who receive treatment remain significantly overweight. Similar to other studies (Epstein et al., 1990; Israel, Stolmaker, & Andrian, 1985), most of the children completing this intervention remained overweight and, for some, significantly overweight. Examining the long-term effects of a program is critical in assessing its effectiveness, which this study was unable to do. Prospective longitudinal studies are needed to determine long-term maintenance.

A specific limitation for this investigation is that participants were not randomly assigned. To minimize the possible impact of this limitation, TLD subjects were matched to TAU participants on gender, age, and weight status to examine the relative change in BMI across groups. The fact that TLD participants demonstrated better outcome than TAU participants reduces the likelihood that changes in BMI were due to uncontrolled variables. However, further evaluation of the TLD using randomized clinical trials is needed before the TLD would be considered effective. A final limitation of the present investigation involves the income level of the participants. The cost of the intervention may explain the small number of participants from a lower socioeconomic status (SES) that received services in this study. Given the increased risk of overweight in lower SES populations (Gordon-Larsen, Adair, & Popkin, 2003), additional research with increased cultural and economic diversity is encouraged.

On the basis of these findings, several areas of continued research are warranted. First, more information is needed to examine how the psychological factors associated with childhood overweight are affected by treatment in applied settings. Second, examination of the long-term impact of treatment on physical and mental health outcomes is especially important. Third, additional research is also needed to maximize treatment gains (i.e., weight or BMI reduction), especially in children who are very overweight. Similarly, studies examining universal, selected, and indicated *prevention* programs to reduce the development of overweight in children are needed (see, e.g., McGarvey et al., 2004). Finally, studies examining the cost-effectiveness and cost-benefit ratios of children’s overweight programs will provide valuable information that will be of use in the eventual dissemination of effective programs.

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