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Development of a Multi-Disciplinary Intervention for the Treatment of Childhood Obesity Based on Cognitive Behavioral Therapy

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Along the lines of the evidence-based recommendations, we developed a multi-disciplinary intervention for overweight children 7- to 12-years-old, primarily aiming at helping children to adopt...
healthier eating habits and a physically active lifestyle. The program combined nutrition intervention, based on a non-dieting approach, with physical activity intervention, implemented through the basic principles of Cognitive Behavioral Therapy (CBT), along with parental support. The program was conducted by dieticians with the collaboration of child psychiatrists and pediatricians. Training and regular supervision upon CBT principles application was intended to enhance dieticians’ efficiency. The intervention is currently being evaluated to determine its effectiveness in treating childhood obesity.

KEYWORDS children, cognitive behavioral techniques, non-dieting approach, obesity, parental involvement, supervision

Childhood obesity is considered to be an uncontrolled worldwide epidemic (Wang & Lobstein, 2006) and a major health problem; a picture depicted by newly introduced terminology, such as “globesity” (Deitel, 2002). The great concern for this health entity lies in its many short- and long-term effects: childhood obesity affects almost every system of the body (Freedman, Dietz, Srinivasan, & Berenson, 1999; Reilly et al., 2003; Weiss et al., 2004), has harmful psychosocial (Strauss & Pollack, 2003; Decaluwe, Braet, & Fairburn, 2003) and economic consequences (Wang & Dietz, 2002), and tracks into adulthood (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997; Deshmukh-Taskar et al., 2006). Therefore, a large number of attempts to combat childhood obesity have been made, producing diverse results. Evidence supporting the long-term efficacy of non-invasive intervention programs suggests that principle components include dietary and physical activity intervention, applied through behavioral modification techniques, along with family changes (Barlow, 2007; Young, Northern, Lister, Drummond, & O’Brien, 2007). The fact that these components differ among treatment programs (Collins, Warren, Neve, McCoy, & Stokes, 2006; Snethen, Broome, & Cashin, 2006; Gibson, Peto, Warren, & dos Santos Silva, 2006), combined with the difficulty of isolating a single component to assess its effectiveness, has led to no current consensus on the most effective type of intervention. Hence, the need for the development, implementation, and evaluation of widely applicable therapeutic measures is still substantial.

We aimed at developing a program for the management of childhood obesity addressing multiple factors known to contribute to the problem, based on the use of Cognitive Behavioral Therapy (CBT) principles, which can be implemented by trained dieticians. As currently no such program is available on a local level, where obesity is on the rise (Papadimitriou, Kounadi, Konstantinidou, Xepapadaki, & Nicolaidou, 2006), the need for its development becomes more imperative. A detailed description of the
protocol and its components, after a brief review of the evidence on which it is based, is provided for future reference or replication.

METHODOLOGY DEVELOPMENT

Building on Evidence-Based Recommendations

DIETARY INTERVENTIONS

Although evidence evaluating the single effect of diet on managing overweight in children is lacking, inclusion of a dietary component in the treatment seems to add a therapeutic benefit (Collins et al., 2006). Energy restriction is fundamental in achieving weight regulation, and energy deficit has been achieved either by administrating hypocaloric diets, or by using non-dieting approaches. The most common hypo-caloric diet is the “traffic light” diet, first developed by Epstein and colleagues (1981): Foods are divided into three groups based on their energy and fat content, and greens can be consumed freely, oranges should be consumed with caution, and reds should be avoided. A daily or weekly number of servings for each of these food groups is then recommended. Less restrictive dietary interventions have been successfully used, promoting the notion of “eating differently, not necessarily less” (Braet, 1999), focusing on food choices (Gehling, Magarey, & Daniels, 2005) or proposing ad libitum low-glycemic diets (Ebbeling et al., 2005). The need for less restrictive interventions is also posed by implications showing that flexible rather than rigid dietary restraint is associated with lower Body Mass Index (BMI) values and a more successful long-term weight control, both in adults and children (Westenhoefer, 2002; Westenhoefer, Stunkard, & Pudel, 1999), while it is further enhanced by concerns that obese children are at high risk for developing eating disorders or showing resistance to therapy (Decaluwe & Braet, 2005). Furthermore, according to evidence from observational studies which point to eating patterns and different types of foods as a link to overweight in children (Moreno & Rodriguez, 2007), current recommendations suggest dietary treatments should focus on food behaviors—such as breakfast skipping and meal frequency, eating out and portion size (Spear et al., 2007)—rather than energy intake (total calories) and macro-nutrient composition (percentage of carbohydrate, fat, and protein to total calories).

PHYSICAL ACTIVITY INTERVENTIONS

Apart from having been associated with lower obesity risk in children (Abbott & Davies, 2004; Berkey, Rockett, Gillman, & Colditz, 2003), physical activity has also been proven crucial in weight loss maintenance and in decreasing cardiovascular and diabetes risks, even independently of weight
reduction (Meyer, Kundt, Lenschow, Schuff-Werner, & Kienast, 2006; Nassis et al., 2005). Conversely, physical inactivity, especially as television viewing, has been shown to be a risk factor for obesity in pediatric populations (Obarzanek et al., 1994; Andersen, Crespo, Bartlett, Cheskin, & Pratt, 1998; Crespo et al., 2001). According to the behavioral economics model, physical activity and sedentary activities are the two sides of the same coin and may be seen as substitutes, meaning that a reduction in one parameter is expected to result in at least some increase in the other (Epstein & Roemmich, 2001). Based on this assumption, both an increase in physical activity and a decrease in sedentary activities have been tested in laboratory and field studies for the treatment of childhood obesity. Evidence from a 10-year follow-up study suggests that physical activity as a lifestyle change is a promising, feasible, and convenient way for managing overweight in children (Epstein, Valoski, Wing, & McCurley, 1990), while both structured and non-structured activities have been beneficial in reducing BMI in children (Berkey et al., 2003). Alternatively, targeting sedentary activities has been proven at least as (Epstein, Paluch, Gordy, & Dorn, 2000) or even more (Epstein et al., 1995) effective in reducing percent overweight in children compared to targeting an increase in physical activity per se. Moreover, greater increases in physical activities or decreases in sedentary activities did not add any further benefit, meaning that changes in physical activity profile in children reach a plateau (Epstein et al., 2000). Recommendations regarding physical activity in children target a generally active lifestyle, and suggest at least 60 minutes of moderate intensity physical activity, if possible every day, and not exceeding 2 hours of screen time daily (Spear et al., 2007). Within school settings, individual or team non-competitive sports, and recreational activities are recommended (American Academy of Pediatrics, 2000), as well as an active participation in physical education classes (Carrel et al., 2005).

**Behavioral Change Interventions**

Both parameters of energy balance—that is, energy intake and energy expenditure—are directly affected by behaviors related to dietary intake and physical activity choices, exemplifying why studying behavior in the context of combating obesity has attracted great scientific interest. CBT has been originally proposed for the treatment of emotional and behavioral disorders, such as depression and anxiety (Beck, 1991). The efficacy, the defined methodology, and the replication of findings inspired its application to a wide range of patient populations and conditions, including pediatric population with chronic diseases, like obesity (Powers, Jones, & Jones, 2005). CBT is recognized as a methodology for the systematic modification of eating, exercise, or other behaviors thought to contribute to or maintain obesity (Foreyt & Poston, 1998b). Features of CBT relevant to a dietary
intervention involve the structure of the session, the therapeutic relationship, and related techniques. A typical outline of a CBT session includes checking on mood, reviewing homework, setting the agenda, assigning homework, and summarizing while giving feedback (Beck, 1995; Friedberg & McClure, 2002). The breakthrough relating to CBT refers to the relationship between the therapist and the patient. By introducing collaborative empiricism and guided discovery, it altered the therapeutic relationship, from a “didactic” advising to a collaborative one, minimizing defensive attitude, conflicts, and resistance (Wright, Beck, & Thase, 2003). Aiming at helping the patient not only to implement, but also maintain behavioral change, the techniques most commonly used in CBT interventions are self-monitoring, goal setting, stimulus control, problem solving, relapse prevention, cognitive restructuring, and social support (Foreyt & Poston, 1998a). The beneficial effect of adding behavioral modification techniques in a conventional program for the treatment of childhood obesity has been originally described in the early 1990s (Epstein, Wing, Steranchak, Dickson, & Michelson, 1980; Epstein et al., 1985), and has been confirmed many times ever since (Jelalian & Saelens, 1999). Although it is difficult to isolate a specific technique and assess its effectiveness, some of the CBT techniques have been evaluated and proven to have a positive effect in pediatric populations—such as self-monitoring (Kirschenbaum, Germann, & Rich, 2005), stimulus control (Golan, Fainaru, & Weizman, 1998), and problem solving (Graves, Meyers, & Clark, 1988). Behavioral programs for childhood obesity integrate some or most of these CBT techniques.

PARENTAL INVOLVEMENT

Parents affect children’s eating and physical activity patterns by several means; namely, formulating children’s environment, being role models, and controlling their dietary intake (Johnson-Taylor & Everhart, 2006). Participation of parents in a program that aims at modifying the child’s eating habits and reducing overweight is considered necessary, hence a great body of research addresses the question of the most effective parental role. Epstein and colleagues (1990) highly support the role of parents as targets for managing their own weight along with their child’s weight, as results from 10 years of follow-up show a significantly higher reduction in percent overweight of children when both parents and children were targeted for weight loss compared to when only children were targeted. On the other hand, training children in self-regulatory techniques compared to assigning parents most responsibility for change was proven essential in maintaining percent overweight loss after treatment (Israel, Guile, Baker, & Silverman, 1994). In the studies of Golan and Crow (2004), parents as exclusive agents of change, without any direct children involvement, were found to be more efficient in managing children’s weight when compared to children being the exclusive
agents. Evidently, studies are not conclusive in regard to the most effective parental role or the exact degree of parental involvement. Recommendations so far suggest a generally supportive role of parents, with descending involvement as the child gets older (Barlow, 2007), and this seems to be the approach most widely adopted (Graves et al., 1988; Nuutinen, 1991; Duffy & Spence, 1993; Flodmark, Ohlsson, Ryden, & Sveger, 1993; Braet & Van Winckel, 2000; Levine, Ringham, Kalarchian, Wisniewski, & Marcus, 2001; Reinehr, Kersting, Alexy, & Andler, 2003; Jiang, Xia, Greiner, Lian, & Rosenqvist, 2005; Korsten-Reck, Kromeyer-Hauschild, Wolfarth, Dickhuth, & Berg, 2005; Nemet et al., 2005).

Procedures: Detailed Description of Program Components and Structure

Along the lines of the aforementioned evidence, we developed a dietary intervention addressing multiple factors known to contribute to childhood obesity in regard to diet and physical activity for children aged 7 to 12 years old. The aim of the program is to encourage children adopt both healthier eating habits and a less sedentary lifestyle, and thus regulate their body weight. The program consists of 12 weekly 1-hour sessions, conducted individually. Topics concerning both dietary- and physical activity-related issues are introduced at each session, the agenda of which is briefly presented in Table 1. At the beginning of the program, more emphasis is put on “the do’s” rather than “the don’ts”; for example, children are initially requested to add salad at meals or increase everyday physical activity rather than decrease sweet intake or TV viewing. Goals are set depending on the child's current habits and readiness to change, with progressively increased intensity, while previous goals achieved are maintained or further enhanced.

The dietary intervention is based on a non-dieting approach, which encourages flexible dietary control, focuses on problematic eating behaviors, and fosters a “more or less” as opposed to an “everything or nothing” approach (Westenhoefer, 2002). Different aspects of dietary habits are addressed emphasizing dietary quality and meal patterns, without using a pre-determined dietary plan or a calorie limit. Complete meals are the first dietary issue discussed, referring to the quality of meals, and virtually aiming at encouraging consumption of fruits and vegetables throughout the day. A complete meal is defined as that including a source of protein, a source of starch, and a fruit or vegetable, distinguishing from incomplete or less balanced meals (Lennernas & Andersson, 1999). Other issues include breakfast consumption, snack at school, consumption of high energy dense food, total eating episodes, portion size, and eating conditions—or “5 onlys” as mentioned elsewhere (Golan et al., 1998), which confine eating only when seated, without doing something else, at the right place, with proper utensils, and when hungry. Regarding physical activity, both an increase in energy
### Table 1: Agenda of the Main Topics Addressed in Each Session of the Program

<table>
<thead>
<tr>
<th>Session</th>
<th>Agenda</th>
</tr>
</thead>
</table>
| 1.     | Establishing rapport  
         Exploring motives  
         Nutrition goal:  
         - Improving meal quality: complete meals (including a source of starch, a source of protein and a fruit or vegetable) |
| 2.     | Nutrition goals:  
         - Regular breakfast consumption  
         - Eating condition “only seated,” and not while standing or lying  
         Physical activity goals:  
         - Increase in everyday physical activities, such as going to school on foot, playing during school time or after school, walking the dog |
| 3.     | Nutrition goals:  
         - Inclusion of a healthy school and afternoon snack  
         - Eating condition “without doing something else,” such as watching TV  
         Physical activity goals:  
         - Gradual decline in time allocated to screen; i.e., TV viewing, computer games, video, as recreational activity  
         - Exploring possibilities of attending a sports team |
| 4.     | Revision and problem detection  
         Recording of physical activity with a pedometer, used as a self-monitoring tool |
| 5.     | Nutrition goals:  
         - Meal size—reducing food portion by a quarter, excluding fruits or vegetables  
         - Eating condition “from proper size utensils”; e.g., getting served from different dishes or big packaging exactly the amount wanted  
         Physical activity goals:  
         - Set a tailored budget of screen time per day or week, desired final goal of 1–2 hours screen time per day, or 12 hours per week  
         - Using pedometer recording to enhance physical activity |
| 6.     | Nutrition goals:  
         - Reduction of sweets and other energy dense, high sugar, and fat foods: set a tailored weekly budget, desired final goal of 2–3 per week  
         - Eating condition “only when hungry,” and not when seeing or smelling food, or feeling lonely or upset  
         Physical activity goals:  
         - Comparing pedometer records between 2 last weeks—exploring if and how much reducing TV viewing resulted in an increase in pedometer measurements, discussion on possible solutions to further enhance result |
| 7.     | Nutrition goals:  
         - Practicing of stimulus control—alternative solutions  
         - Eating condition “only in the kitchen or dining room,” and not; e.g., in the bedroom  
         Physical activity goals:  
         - Active participation in the physical education school curriculum and sports |
| 8.     | Revision and problem detection  
         Emphasis on less achieved goals |
| 9.     | Nutrition goals:  
         - Healthy meal patterns: total number of meals and snacks per day  
         Physical activity goals:  
         - Sports attendance |
| 10.    | Relapse prevention  
         Projection to the future |
| 11.    | Revision and feedback |
| 12.    | Importance of follow-up |
expending activities and a decrease in sedentary behaviors are targeted. An 
active lifestyle is supported, primarily achieved by everyday non-structured 
activities and further enhanced by sports engagement. Being active during 
school—i.e., playing in break time and participating in physical education 
classes—is also dealt with. On the other hand, a budget of TV viewing hours 
is agreed upon, leaving the child free to choose what to watch and decide 
how to best distribute available time. In order to encourage children’s 
self-monitoring and efforts to increase physical activity, pedometers record-
ing the number of total steps taken daily are being used, and comparisons 
between active and sedentary days form the basis for discussion. All dietary 
and physical activity aspects are placed in the context of energy balance. 

Taking into consideration developmental issues, the sessions have a 
playful character, integrating games, reference to children’s favorite heroes, 
role-playing, appropriate use of open and close questions, and translation 
of abstract notions into concrete and tangible examples. For instance, 
education on complete meals is carried out with the use of three dolls, each 
one representing a food group. The dolls, as tall as a 6-year-old child, have a 
funny name and hold a basket with food models of each food group 
described. Moreover, for explaining the eating conditions, cards presenting 
the desirable and the undesirable conditions have been specifically designed 
for the needs of the program. In general, every goal set is clearly defined and 
examples are done to ensure an adequate level of understanding. 

Most of the specific CBT techniques incorporated into programs target-
ing childhood obesity are applied—such as goal setting, self-monitoring, 
rewarding, problem solving, food-related stimulus control, cognitive restruc-
turing, and relapse prevention. At each session, an average of 3 to 5 goals are 
set, related to both diet and physical activity. Goals are individualized, 
realistic, and specific. Children are asked to self-monitor their behavior every 
day. A monitoring sheet is given where they can either tick or write com-
ments regarding the goals set, while on return three areas are being discussed 
and recorded: what was achieved, barriers met, and solutions to achieve 
more next time. Finding alternatives and overcoming barriers to change 
are highly valued, and guided discovery is the principal technique used for 
their accomplishment, as well as for goal setting. As research on the use of 
rewarding has proposed that oral rather than tangible rewards, small rather 
than large ones, and rewards for the quality rather than the quantity of the 
behavior seem to be more successful (Eisenberger & Cameron, 1996); children 
are rewarded for their progress with a sticker of their favorite hero, whereas 
oral support is given throughout the program. Moreover, as long-term adop-
tion of the desired habits is the goal, the oral rewarding given is combined 
with what the child benefited from the changes he/she made, so that the 
changes would act as intrinsic reinforcers (Foreyt & Goodrick, 1993). How-
ever, in highly resistant children an extra reward is given in the form of a 
present, bought by the parent. All techniques are applied in the context of
a collaborative relationship, establishing a sound alliance, and promoting active participation of the child.

Parents have been assigned a supportive role. Before the beginning of the program, the parent or caregiver is informed on the scope and the methods of the program, the realistic goals regarding weight change, and the commitments she or he will be called to fulfil. Parents have to provide a supportive environment in terms of food availability and accessibility, meal frequency, practices used to control the child’s dietary intake, atmosphere during mealtime, opportunities to exercise, and of course punctuality to the appointments. The last 10 minutes of each session, the parent is being informed on the topics discussed, and is asked to suggest ways of supporting the child to implement the goals set, or even modifying the goals if considered unrealistic, and work together with the child in order to enhance its effectiveness.

The program is being implemented by dieticians, who are supported by a team of pediatricians and child psychiatrists from a major public children’s hospital. Dieticians are appropriately trained on the application of CBT techniques by a 4-day seminar conducted prior to the beginning of the program, and supervision is provided on a bi-weekly basis. The seminar includes training on (a) the basic principles of CBT—such as cognitive model, the notion of collaborative empiricism and guided discovery, and specific CBT techniques; (b) specific developmental issues for youngsters; and (c) the application of the above principles to the study protocol. Moreover, throughout the program, supervision of the dietitians takes place every 2 weeks. The aim of the supervision is to support dieticians in handling issues concerning the therapeutic relationship as well as in implementing CBT techniques in order to increase children’s compliance to the intervention protocol. Seminars and supervision are being carried out by a child psychiatrist and a psychiatrist highly experienced in CBT training (Pehlivanidis et al., 2006).

In order to enhance the therapeutic effect, booster sessions are scheduled after the intensive treatment phase. Booster sessions aim at lengthening the time during which behavioral change is maintained, as well as gradually fading the degree of therapeutic contact (Wing, Epstein, Marcus, & Koeske, 1984). Following the 12 weekly sessions of the core program, 8 booster sessions are planned, the first 6 of which on a monthly basis, and the remaining 2 in 6-month intervals.

**DISCUSSION AND CONCLUSIONS**

Building on evidence-based recommendations for the treatment of childhood obesity, we developed an intervention addressing multiple factors implicated in the development and maintenance of overweight and obesity in children. A standardized dietary and physical activity intervention
implemented with the application of CBT techniques is proposed, aiming at improving habits and achieving lifestyle changes in the long-term. A detailed description of the structure and the key components of the program are provided, considered necessary for results interpretation, comparison with other approaches, or replication.

Application of flexible behavioral control constitutes one of the basic characteristics of the program. In regard to both dietary and physical activity changes, children are asked to control their behavior in a flexible rather than rigid way, primarily by achieving relative changes based on their current habits, by setting goals to gradually improve the latter, and at last by assuming a feasible “budget” within which they could manage their behavior. Flexible behavioral control may be seen as an approach to increase internal locus of control, namely the extent to which individuals believe that they can influence events through their own actions (Rotter, 1966). Recent findings suggest that a stronger sense of control over one’s life in childhood is associated with a reduced risk of overweight and obesity in adult life, as well as with a better self-rated health (Gale, Batty, & Deary, 2008). Moreover, in accordance to the four parenting styles proposed, based on the strategies parents raise their children, and their implication in children’s weight status (Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006), flexible behavioral control seems to promote the authoritative style on behalf of the child, combining freedom of choice with setting limits. Avoiding the application of rigid control also fits better the context of the collaborative relationship, thus it is expected to increase children’s concordance and compliance to instructions.

As long-term efficacy of therapeutic interventions in pediatric obese populations remains a challenge, an emerging need has been recognized to address weight loss maintenance post-intervention. To this direction, extension of treatment contact or content has been proposed by adult studies, either by lengthening the treatment period (Jeffery et al., 2000), which has been successfully tested in children as well (Wilfley et al., 2007), or by planning booster sessions (Wing et al., 1984). To our knowledge, no intervention targeting childhood obesity has so far included booster sessions. The current approach has incorporated booster sessions as an integral part of the protocol, anticipating an enhancement of the therapeutic effect gained over the intense treatment program.

The program is being conducted by dieticians with the collaboration of other health professionals—namely psychiatrists and pediatricians—as a team approach is recommended for a more intensive therapeutic intervention (Barlow, 2007). Literature suggests dieticians should improve their skills in regard to behavioral change accomplishment (Foreyt & Poston, 1998a; Rapoport, 1998; Stewart, Houghton, Hughes, Pearson, & Reilly, 2005), and CBT is a methodology offering such an opportunity (Stunkard, 1996). In this direction, dieticians of the program are trained by both attending a seminar on CBT issues and receiving regular supervision upon their
application. A short training in CBT techniques has a rather limited influence, as it cannot provide guidance in handling issues, which are likely to appear throughout the program. Supervision, however, may be seen as an ongoing training, based on specific examples requesting immediate solution and been, in a way, tailored to the participants’ features. This is the first time supervision is applied in an intervention targeting childhood obesity. Psychiatrists are responsible for the dieticians’ training in CBT issues and their supervision, and pediatricians for the medical assessment and support, as well as for subject recruitment.

The intervention developed is currently being evaluated. Children are being recruited from a major children’s public hospital in Athens, where they undergo a full clinical and biochemical assessment before entering the program. The primary inclusion criteria are age between 7- to 12-years-old and presence of overweight or obesity, defined by using the age- and sex-specific BMI cut-off points for children and adolescents adopted by the International Obesity Task Force (Cole, Bellizzi, Flegal, & Dietz, 2000). The outcome measures assessed are shown in Table 2. All parameters will be evaluated at the beginning of the program, at 6-months follow-up and every year afterwards, with the exception of dietary and physical activity parameters which are also measured immediately after the completion of the program (i.e., at 3 months.

### TABLE 2 Selected Outcome Measures for Assessing the Effectiveness of the Intervention Developed

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Outcome measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropometric</td>
<td>Percent overweight,$^a$(weight, height, Body Mass Index,$^b$ percent body fat (assessed by dual energy X-ray absorptiometry)</td>
</tr>
<tr>
<td>Dietary intake</td>
<td>Energy and macro-nutrient intake, consumption of specific food groups (e.g., fruits, vegetables, sweets), meal pattern (e.g., breakfast consumption, number of eating episodes), (all assessed by two consecutive 24-hour recalls)</td>
</tr>
<tr>
<td>Dietary behavior</td>
<td>Eating in response to external stimuli, emotional cues, or restraint (assessed by the Dutch Eating Behavior Questionnaire, completed by the parents for their children)$^c$</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Time allocated to moderate-to-vigorous intensity physical activities, and weighted-activity-metabolic-equivalent (WAMET) score (an index of physical activity adjusted for the intensity of exercise), total screen time (i.e., time spent on TV viewing, videogames, computer) (all assessed by a physical activity checklist)$^d$</td>
</tr>
<tr>
<td>Biochemical &amp; metabolic</td>
<td>Fasting glucose, lipid and lipoprotein profile (e.g., triglycerides, cholesterol esters and their lipoproteins), hormonal and inflammatory markers (e.g., insulin, cortisol, IL-6, TNF-a, adiponectin)</td>
</tr>
<tr>
<td>Psychological</td>
<td>Self-esteem, depression, anxiety, behavior problems (in children)$^e$ Depression, family function (in parents)$^f$</td>
</tr>
</tbody>
</table>

*Note. $^a$[(current BMI – BMI cut-off for overweight)/BMI cut-off for overweight] × 100, where BMI cut-offs are based on Cole et al., 2000; $^b$weight (kg)/height$^2$ (m$^2$); $^c$Braet & Van Strien, 1997; $^d$Gioxari et al., 2005; $^e$Battle, 1981; Kovacs, 1985; Liakos & Giannitsi, 1984; Roussos et al., 1999, respectively; $^f$Beck & Steer, 1993; Miller, Epstein, Bishop, & Keitner,1983, respectively.*
from baseline), and body weight and height which are additionally measured every 2 weeks during the intervention phase. In order to assess the effectiveness of the intervention proposed as a favorable alternative to the standard care, and to further examine the impact of parental involvement, children receiving the intervention will be compared to a group receiving the usual care provided in the children’s public hospital, and to a group of children receiving the same intervention but differing only in the degree of parental participation. Results are anticipated in order to verify or disprove our expectation for a successful therapeutic approach for childhood obesity. As obesity has become a major health issue among youths, developing multidisciplinary approaches targeting the various factors known to be involved in the etiology of childhood obesity will likely help clinicians and practitioners in the management of childhood obesity.

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