

REVIEW ARTICLE

Interventions addressing general parenting to prevent or treat childhood obesity

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Abstract

Observational studies increasingly emphasize the impact of general parenting on the development of childhood overweight and obesity. The aim of the current literature review was to provide an overview of interventions addressing general parenting in order to prevent or treat childhood obesity. Electronic literature databases were systematically searched for relevant studies. Seven studies were eligible for inclusion. The studies described four different general parenting programs, which were supplemented with lifestyle components (i.e., physical activity and nutrition). All studies showed significant small to moderate intervention effects on at least one weight-related outcome measure. The current review shows that despite the emerging observational evidence for the role of parenting in children's weight-related outcomes, few interventions have been developed that address general parenting in the prevention of childhood obesity. These interventions provide evidence that the promotion of authoritative parenting is an effective strategy for the prevention and management of childhood obesity.

Keywords: Child, child preschool, infant, intervention studies, obesity, overweight, parenting, prevention and control, review, therapy

Introduction

Overweight and obesity in children is a significant public health problem (1,2). The current prevalence of overweight and obesity varies considerably across parts of the world, with North America, Europe and parts of the Western Pacific having the highest prevalence of overweight among children (approximately 20–30%) (2). Increasingly, children become overweight at a relatively young age. Being overweight as a child increases the risk of becoming an overweight adult, compared to normal-weight children (3–5). Obesity in childhood is also associated with health consequences like cardiovascular diseases and type 2 diabetes, and social consequences such as teasing and discrimination (6,7).

A large number of interventions to prevent or treat overweight in childhood have been developed, which have been extensively described in various systematic reviews (8–13). These reviews show that the majority of the interventions focus on changing so-called energy

balance-related behaviors, that is, improving children's dietary intake and increasing their levels of physical activity (14). However, there is still debate on the best way to design an intervention to achieve maximal and sustainable effects on child outcomes (8).

Intervention research has increasingly highlighted the importance of parents and family involvement in child obesity treatment and prevention (15–17). Parents determine their child's lifestyle to a large extent, especially in the early years of life, and several intervention studies have demonstrated that involving the family in the treatment of childhood overweight is an effective approach. For example, Epstein and colleagues showed that including parents as active participants in habit change and weight loss was effective in terms of weight control among children at five-year follow-up (18); these effects were maintained over extended periods from childhood through adolescence and adulthood (19,20). Golan (21) showed that targeting parents as exclusive moderators resulted

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in greater reduction in children's percentage overweight than targeting both parents and children or targeting children alone. Similarly, prevention studies have shown that parents can be supported in achieving effective behavioral changes that seem likely to reduce the degree of overweight in their children (12).

A distinction between specific and general family-based intervention goals has been made in the existing literature (17). A specific intervention focus involves parents in changing specific child behaviors related to eating and exercise, i.e. changing specific parenting practices. A general intervention aims at changing the broader family context or family functioning (17). One important dimension of the family context concerns 'general parenting' or 'parenting styles', which is the focus of the current paper. It describes parent-child interactions across a wide range of situations, and can be regarded as the context of behavior-specific parenting (22). Parenting styles are often rated using two dimensions: an index of parental responsiveness (warmth, acceptance or involvement) and an index of parental demandingness (control or strictness) (23). The combination of these dimensions results in a fourfold classification of parenting: authoritative, authoritarian, indulgent (similar to permissive), and neglectful (similar to uninvolved).

While originally (and successfully) applied in the prediction of childhood problem behaviors, to date multiple observational studies have also provided evidence for the impact of general parenting on children's weight status and related health behaviors (24). Such observational studies have indicated the potential of general interventions addressing these general parenting skills in attempts to prevent or treat childhood obesity. Although some researchers already underlined the importance of targeting the broader family context in the prevention or treatment of childhood obesity (17,25), to date no reviews have focused exclusively on interventions that incorporated general parenting. The aim of the current review was therefore to provide an overview of interventions which address general parenting in order to prevent or treat obesity in youth (0–18 years).

Methods

Studies that were eligible for the present systematic review were searched for in the computerized databases Pubmed, PsycINFO and Scopus, using combinations of the following keywords: parents, parenting, child, infant, overweight, obesity, weight gain, intervention, and prevention. We included dissertations and studies published in peer-reviewed journals until February 2010.

Studies were first assessed on their title and then on their abstract, by two reviewers (S.G. and E.S.) independently of each other. To be included in the present study, intervention studies had to meet the following inclusion criteria:

- (1) The intervention study had to focus on children or adolescents (aged 0–18).
- (2) The primary aim of the intervention had to be the prevention or treatment of overweight or obesity.
- (3) The study had to describe intervention components addressing general parenting.
- (4) The study had to have used anthropometric measurements at baseline and follow-up to describe the effectiveness of the intervention.
- (5) The article had to be in English.

Studies which aimed to change to the children's broader environment, e.g., the emotional climate of the family were excluded from the present review.

In total, 1057 papers were initially identified in Pubmed, PsychInfo and Scopus using the selected keywords. These were all screened on title, leading to 118 eligible hits. Of these, 55 were eliminated based on abstract evaluation. The remaining 63 papers were retrieved for reading the full-text. This resulted in four studies which were considered eligible for inclusion. Major reasons for studies not being included in the current review were: no intervention studies ($n = 757$), interventions not aimed at treatment or prevention of childhood overweight ($n = 133$), interventions not targeting children or not including parents ($n = 69$), no intervention components on general parenting ($n = 69$), no intervention effects reported ($n = 14$), and paper not in English available ($n = 15$). After the electronic literature search, we applied reference tracking, which led to three additional references, leading to seven eligible studies.

Data extraction and analysis

The data extraction process of the included studies consisted of three steps. First, we described the general characteristics of the studies: location, inclusion and exclusion criteria of the study participants, design, treatment groups, follow-up, drop-out rates, and characteristics of the study sample. Second, the intervention used in the included studies was outlined by describing the duration, the target group, the components of the intervention targeting general parenting, and the components of the intervention addressing physical (in)activity and nutrition. The final part of the qualitative data extraction process regarded the results of the interventions, including

the anthropometric measures of overweight. If available, measures of physical activity (or inactivity) and nutrition and parenting measures were also recorded. These data were abstracted by the first author (S.G.) and checked by the second author (E.S.).

In addition, effect sizes (Cohen's *d*) were calculated for tests of differential change in weight measures across the intervention and control conditions. Cohen's *d* is calculated by dividing weight changes by the pooled standard deviation of the baseline weight of the study population (26). In the case of multiple intervention groups, the effect sizes of all interventions were assessed. In studies without an appropriate control group, Cohen's *d* was calculated by dividing the mean weight change by the standard deviation of the baseline weight. Effect sizes (ES) were interpreted using the classification defined by Lipsey (27): small effect (ES 0.00–0.32), moderate effect (ES 0.33–0.55), or large effect (ES 0.56 and more).

Results

General study characteristics

Seven intervention studies, described in nine papers, were identified as meeting the inclusion criteria (28–36). General study characteristics are described in Table I. The studies were published between 1975 and 2008. Three studies had been conducted in the USA (28–30), one in the USA and Canada (31), two in Australia (33,35) and one in the UK (36). All authors reported inclusion and/or exclusion criteria to determine who could participate in the intervention. An age limit was reported in each study as an inclusion criterion and five studies exclusively included overweight children (29,30,33,35,36). Six studies were based on a Randomized Controlled Trial (RCT), with participants randomly allocated to either two or three different experimental groups. One study (36) made use of a pretest-posttest design in which all participants received the same treatment. Participants in all studies were assessed at baseline and immediately at the end of the intervention. With the exception of the study of Harvey-Berino and Rourke (31), study participants were also assessed after a period of no further intervention, to indicate maintenance of the intervention effects. These follow-up periods ranged from 20 weeks to three years. The drop-out rate of participants in the studies was reported per group at each measurement, ranging from 0% (28, 31) to 60% (28). The drop-out rate did not differ significantly between the experimental and control groups, except for in Aragona et al. (28) and Harvey-Berino and Rourke (31).

Five studies included less than 50 participants, whereas the two remaining studies included more

than 100 children (mean = 52 participants). Only the study of Golley (32) reported a sample size calculation. The unweighted mean age of the participants was 8.3 years; one study included preschool children, five studies included children aged between 5 and 11 years and one study included children older than 11 years. Most studies primarily included girls (28,29,33,35,36). In six studies, all participants were overweight or obese, while one study (31) also included normal-weight children. The ethnicity of the participants was reported in four studies: three included mainly Caucasians (33,35,36), and one study included only Native Americans (31).

Intervention description

The interventions are described in Table II. The duration of the interventions ranged from nine weeks to six months (mean = approximately 16 weeks). Four studies had separate intervention components for both parents and children: three of them offered children a multi-component program with group sessions as well as exercise components (24,25,31); and in one study children were provided with an intensive exercise program (23). Two studies mainly focused on the parents but did include the children (active game sessions) (33,35), and one study did not include the children at all (31). The interventions were delivered by different methods, but they all incorporated group sessions for parents. In four studies, the intervention was delivered by intensively trained facilitators, who were supervised during the training (31,32,35,36). In every study, the content of the intervention consisted of components relating to general parenting and specific parenting practices related to physical (in)activity and/or nutrition. The included studies used four different standardized general parenting programs, which are described below.

The first program identified was based on the book 'Living with Children' by Patterson (37,38). Based on Social Learning concepts from Skinner (39) and Bandura (40), the book gives parents brief, very specific instructions on how to change behaviors which almost every parent encounters. It offers programmed instructions, in which the main ideas in the book are broken down into small items on which parents have to respond by writing down an answer.

Three different studies described an intervention that provided parents with 'Living with Children' to help them acquire child management skills. Aragona et al. (28) used the book as a guidance for the content of the group sessions with parents, while the control group did not receive the book. Israel et al. (29,30) performed two studies in which they based the lectures in their intervention on the content of the book,

Table I. Characteristics of studies included.

Study	Location	Inclusion and exclusion criteria of the study participants	Design	Treatment groups ^a	Follow-up	Drop-out	Baseline characteristics
Aragona et al. 1975 (28)	Florida, USA	<i>Inclusion:</i> a. age 5–11 years <i>Exclusion:</i> a. psychotherapy, drug therapy, or involved in a weight reduction program	RCT	1 = Response-Cost plus Reinforcement (RCR; <i>n</i> = 4) 2 = Response-Cost only (RC; <i>n</i> = 3) 3 = Control group (C; <i>n</i> = 5)	12 ^b , 20 and 43 weeks	12 weeks No drop-out 20 week C group: 20% 43 weeks C group: 60%	<i>n</i> = 12 <i>Mean age:</i> not reported, range 5–11 years <i>Gender:</i> 100% female <i>Weight status:</i> all children were overweight <i>Ethnicity:</i> not reported <i>n</i> = 33 <i>Mean age:</i> 11.3 years <i>Gender:</i> 30% male <i>Weight status:</i> all children were overweight <i>Ethnicity:</i> not reported
Israel et al. 1985 (29)	Albany, New York, USA	<i>Inclusion:</i> a. age 8–12 years b. ≥20% overweight c. medical clearance from physician <i>Exclusion:</i> -	RCT	1 = Behavioral weight reduction plus Parent Training group (PT; <i>n</i> = 12) 2 = Behavioral Weight Reduction Only group (WRO; <i>n</i> = 12) 3 = Wait-List Control group (WLC; <i>n</i> = 9)	9 weeks ^b and 1 year (only PT and WRO groups)	9 weeks 9.1% ^c 1 year 30.3% ^c	<i>n</i> = 34 <i>Mean age:</i> 10.9 (1.2) years <i>Gender:</i> not reported <i>Weight status:</i> all children were overweight <i>Ethnicity:</i> not reported
Israel et al. 1994 (30)	Albany, New York, USA	<i>Inclusion:</i> a. age 8–13 years b. ≥20% overweight according to weight for height, age and gender standards c. one parent willing to attend sessions and cooperated with requirements d. medical clearance from physician e. absence of physical or psychological problems <i>Exclusion:</i> -	RCT	1 = Standard Treatment group (ST; <i>n</i> = 18) 2 = Enhanced Child Involvement group (ECI; <i>n</i> = 16)	26 weeks ^b , 1 year and 3 years	26 weeks ST group: 22% ECI group: 25% 1 and 3 years ST group: 39% ECI group: 44%	<i>n</i> = 34 <i>Mean age:</i> 10.9 (1.2) years <i>Gender:</i> not reported <i>Weight status:</i> all children were overweight <i>Ethnicity:</i> not reported
Harvey-Berino and Rourke 2003 (31)	New York, USA & Ontario and Quebec, Canada	<i>Inclusion:</i> a. age 9 months – 3 years b. able to walk c. mother's BMI >25 d. mother agreed to keep all treatment appointments <i>Exclusion:</i> -	RCT	1 = Obesity Prevention plus Parenting Support (OPPS; <i>n</i> = 20) 2 = Parenting Support (PS; <i>n</i> = 20)	16 weeks ^b	16 weeks OPPS group: 13%	<i>n</i> = 43 ^d <i>Mean age:</i> 21 months <i>Gender:</i> 54% male <i>Weight-for-height z-score:</i> OPPS = 0.79; PS = 0.67 <i>Ethnicity:</i> Native American

(Continued)

Table II. Intervention components.

Study	Duration	Target Group	Intervention components	
			General parenting	Physical activity/Nutrition
Aragona et al. (28)	12 weeks	Parents and children	<p><i>Response-Cost plus Reinforcement group (RCR)</i> Instructions on changing their child's behavior: parents received a copy of Living with Children (37). Content was continuously discussed at subsequent meetings.</p> <p><i>Response-Cost only group (RC)</i> These parents did not receive a copy of Living with Children.</p>	<p><i>RCR group & RC group</i> Exercise program for children: daily series of 30 minutes of exercise over 3 weeks, increasing level of difficulty. Nutritional information for parents: discussions of the content of 'Food and Your Weight' and 'Nutrition'. Stimulus control information for parents: implementing techniques such as training to eat more slowly, delaying gratification, eating in one designated area, eating low-calorie snacks, leaving food on the plate and making non-fattening foods look more palatable.</p> <p><i>RCR group</i> Parents kept a daily food diary and graphed daily caloric intake and weight of their child. Response-cost contract: parents had to deposit money with the experimenters. They could redeem this money by attendance, bringing completed graphs and charts and by their child losing weight. Instructions on reinforcement for parents: each week a reinforcer for losing weight was negotiated between parent, child, and experimenters. Parents kept a daily reinforcement diary.</p> <p><i>RC group</i> These parents did not receive reinforcement information, they were not told to reinforce their child in terms of preferred eating behaviors and weight loss, and did not keep a reinforcement diary.</p>
Israel et al. (29)	9 weeks	Parents and children	<p><i>Behavioral weight reduction plus Parent Training group (PT)</i> Prior to the start of the weight reduction program, these parents attended 2-hour sessions in which they were instructed on behavioral child management skills. The lectures were based on Living with Children (38). Parents had to read the book and do 3 quizzes about the content, to ensure they understood it well. Concepts presented were systematically referred to during the ensuing treatment program.</p> <p><i>Weight Reduction Only group (WRO)</i> Did not attend the sessions about behavioral child management.</p>	<p><i>PT group & WRO group</i> Participants attended 9 weekly 90-minute sessions of the weight reduction program. Parents and children participated in separate groups. A four-pronged format (CAIR = control Cues, Activity, food Intake, and Rewards) was addressed at each session and individualized for each family. Families had to monitor diet and activity and adherence to recommended changes in weight-related habits. Homework was collected and reviewed at each treatment session. The sessions with parents and children consisted of lectures and discussions to facilitate exchange of information and experiences and to provide individualized programming. After the nine weekly sessions, parents and children came for weighing and problem solving discussions at 1, 2, 4, 6, 9, and 12 months.</p>

(Continued)

Table II. (Continued).

Israel et al. (30)	26 weeks Parents and children	<p><i>Standard Treatment group (ST) & Enhanced Child Involvement group (ECI)</i></p> <p>Parents received training in general child management principles: 1) identifying problem behaviors; 2) planning a program to change behaviors; and 3) implementing such a program. Moreover, parents were required to read the book <i>Living with Children</i> (38) which paralleled the content of the parent training.</p> <p><i>ST group</i></p> <p>In this condition emphasis was on parental responsibility for the completion of homework assignments and for the motivation of children to follow program rules or prescriptions.</p> <p><i>ECI group</i></p> <p>This condition placed less emphasis on parental control and focused more attention on children's management of their own weight loss efforts. Parents in this group also rewarded children for engaging in self-management skills. Children received training in self-management skills.</p>	<p><i>ST group & ECI group</i></p> <p>Parents and children met in separate groups for 8 weekly 90-minute sessions followed by 9 biweekly sessions for a total of 26 weeks of treatment. The treatment was based on a four-pronged approach identified by the acronym CAIR, consisting of discussions and homework assignments.</p> <p>Families were asked to monitor children's food intake, activity, and adherence to cue control rules, and parents were asked to reward healthy behaviors.</p>
Harvey-Berino and Rourke (31)	16 weeks Parents	<p><i>Obesity Prevention plus Parenting Support group (OPPS) & Parenting Support group (PS)</i></p> <p>Core parenting program based on the Active Parenting curriculum. The curriculum was adapted to make it culturally appropriate. 11 different parenting lesson topics were covered: parenting a special job, ages and stages of children, parenting styles, preventing problems before they start, building a bond, self-care or care of the caregiver, discipline, rules, routines, special problems, and power of encouragement.</p>	<p><i>OPPS group</i></p> <p>The focus of the lessons was exclusively on how improved parenting skills could facilitate appropriate eating and exercise behaviors in children.</p> <p><i>PS group</i></p> <p>Discussions about child or parent eating and exercise behavior were limited, if they came up at all.</p>
Golley (32) Golley et al. (33)	6 months Mainly focused on parents	<p><i>Parenting skills training plus intensive lifestyle education group (P + DA) & Parenting-skills training only group (P)</i></p> <p>Parents received the Triple P program. The program consisted of 4 weekly 2-hour group sessions, followed by 4 weekly 15-minute individual telephone sessions, and then 3 monthly 15-minute individual telephone calls.</p> <p>In the group sessions, significant time is spent on reviewing homework and problem-solving barriers identified by parents before new content is delivered.</p> <p>The individual telephone sessions provided parents with the opportunity to focus on their family.</p>	<p><i>P + DA group</i></p> <p>Parents received 7 additional intensive lifestyle support group sessions. The lifestyle support group sessions focused on lifestyle knowledge and skills.</p> <p>Objectives and strategies:</p> <ul style="list-style-type: none"> - Use the Australian Guide to Healthy Eating (AGHE) to buy, prepare and serve family meals and snacks - AGHE serve sizes & daily food group serves for family provided - Parental monitoring of child and family intake using AGHE - AGHE linked to food-based recommendations to lower energy intake, encourage water, 2-3 serves 1-2% fat - Label reading, recipe modification, child feeding practices, managing appetite <p>Promotion of increasing activity</p> <ul style="list-style-type: none"> - Be active often in a variety of ways, aiming for 30 minutes per day of physical activity; and be active in play, transport, chores, family activities etc. - Limit total screen time to 7-10 hours per week - Education around importance of physical activity, potential barriers and how to overcome these

(Continued)

Table II. (Continued).

Study	Duration	Target Group	Intervention components	
			General parenting	Physical activity/Nutrition
West (35)	12 weeks	Mainly focused on parents	<p><i>Lifestyle Triple P (LTP)</i> The intervention consisted of 8 weekly 90-minute group sessions, 3 weekly 15- to 30-minute telephone sessions and a final 90-minute group session.</p> <p>In the first session motivational interviewing techniques were used to increase parent's commitment to change. Parents learned positive parenting strategies in sessions 2-8. The telephone sessions provided parents with individual support in fine-tuning their strategies. The final session covered skill generalization and maintenance of treatment gains.</p> <p><i>Wait-List Control</i> This group only completed the measurements, afterwards taking part in a Lifestyle Triple P group.</p>	<p>While parents attended the lifestyle sessions, children attended structured, supervised activity sessions developed by physical activity experts. These sessions consisted of fun, non-competitive games designed around aerobic activity and development of fundamental motor skills.</p> <p><i>P group</i> Application of Triple P to eating and activity behaviors was supported by provision of a healthy lifestyle pamphlet.</p> <p><i>WLC group</i> Parents received a healthy lifestyle pamphlet. Parents were contacted by telephone 3-4 times for 5 minutes as a retention strategy during the 12-month wait-list period.</p> <p><i>LTP</i> Parents were encouraged to monitor children's nutrition and physical activity levels in session 1. In sessions 2 and 3 parents used this information to formulate goals for change. In order to achieve these goals, a range of strategies were presented in sessions 2 to 8. Nutrition strategies included ideas for replacing foods and drinks high in added sugar, buying low-fat foods and modifying recipes, reading food labels to identify healthier pre-packaged snacks, and establishing eating routines.</p> <p>Physical activity strategies consisted of ideas for reducing television and computer time, improving children's movement skills, providing active alternatives for sedentary activities, and increasing children's involvement in sport.</p> <p>Children participated in a separate active games session at the beginning and at the end of the program.</p>
Robertson et al. (36)	12 weeks	Parents and children	<p><i>Parents' program</i> Topics of the parents' program included parental skills and family lifestyle. Approaches used were facilitated discussion, role play, goal setting, skill practice, a solutional focus approach and homework.</p> <p>Parenting skills topics were based on the Family Links Nurturing Program and included giving praise, raising self-esteem, positive discipline, consistently enforced family rules, relationships education, emotional health and developing autonomy.</p>	<p><i>Parents' program</i> Family lifestyle topics included controlling the children's eating environment to limit exposure to unhealthy foods, making healthy choices available, food labels, portion sizes, family meal times, cooking advice and the opportunity to try new foods, decreasing sedentary behavior, and increasing sustainable physical activity.</p> <p><i>Children's program</i> 3 components: (1) information on healthy eating, emphasis on food labels, trying new foods and practical food preparation; (2) discussion about the emotional aspects of the children's lives and of living with obesity to develop their emotional literacy, raise self-esteem and build confidence; and (3) increasing physical activity levels by participation in games, new physical activities that could be sustained and the use of pedometers to encourage 10,000 steps per day.</p> <p>Parents and children met mid-session to share an activity and a healthy snack.</p>

AGHE = Australian Guide to Healthy Eating, CAIR = control Cues Activity food Intake and Rewards, ECI = Enhanced Child Involvement, LTP = Lifestyle Triple P, OPPS = Obesity Prevention plus Parenting Support, P = Parenting skills training alone, P + DA = Parenting skills training plus intensive lifestyle education, PS = Parenting Support, PT = Behavioral weight reduction plus Parent Trainings, RC = Response-Cost only, RCR = Response-Cost plus Reinforcement, ST = Standard Treatment, WLC = Wait-List Control, WRO = Behavioral Weight Reduction Only.

while the parents were simultaneously required to read the book. In their 1985 study (29), only the intervention group attended sessions and read the book, whereas the control group did not receive any information about general parenting. In contrast, their 1994 study (30) involved both the experimental and control groups attending the parent training about general child management and reading the book. The difference between the groups was that parents in the standard treatment condition were made responsible for their child's motivation and compliance with the program, whereas in the enhanced child involvement condition, the children were encouraged to manage their own weight loss efforts.

The second general parenting program used in the intervention studies was the Positive Parenting Program (Triple P) (33,35). Triple P is a standardized general parenting program (41), based on social learning principles (42), which aims to promote the parents' competence to manage their child's behavior. Self-management is fostered through self-evaluation and problem solving. Triple P tries to enhance the knowledge, skills and confidence of parents in order to prevent behavioral, emotional, and developmental problems in their children. The basis of Triple P is formed by five core parenting principles: (a) ensuring a safe and engaging environment, (b) creating a positive learning environment, (c) using assertive discipline, (d) having realistic expectations, and (e) taking care of oneself as a parent. These principles are translated into a range of positive parenting strategies: e.g., spend quality time with your child; provide engaging activities; set developmentally appropriate goals; set a good example; establish clear ground rules; give clear and calm instructions; back up instructions with logical consequences, quiet time, or time-out (41).

Golley and colleagues (32–34) were the first to evaluate the effects of a Triple P intervention on childhood obesity, in which parents took part in group sessions. Two experimental groups in their study received Triple P; one of these received additional intensive lifestyle support group sessions which focused on lifestyle knowledge and skills, and their children attended structured supervised activity sessions, while the other group only received a healthy lifestyle pamphlet on top of Triple P. The waiting list control group received only the healthy lifestyle pamphlet. West (35) developed a new version of this Triple P intervention, called Lifestyle Triple P, with a specific focus on increasing physical activity and promoting healthy eating in children. The intervention group, which was provided with Lifestyle Triple P, was compared with a waiting list control group who did not receive any intervention.

The third general parenting program applied in childhood overweight interventions is the Active Parenting curriculum (43), which emphasizes the child's psychological and behavioral goals, logical and natural consequences, mutual respect, and encouragement techniques. Harvey-Berino and Rourke (31) based their intervention on this curriculum. Two groups received the parenting program: a 'parenting support' group, which involved limited discussions on eating and exercise behaviors, and an 'obesity prevention plus parenting support' group, in which the lessons focused exclusively on improvement of parenting to facilitate exercise and healthy eating behaviors.

Finally, one study used the Family Links Nurturing Program, which was originally developed and evaluated for the treatment and prevention of child abuse and neglect (44). The program consists of two parts: a parenting program offered to parents and a school-based intervention. The parenting program is based on four principles: (a) helping parents to develop appropriate expectations, (b) self-awareness and self-esteem, (c) a positive approach to discipline and (d) empathy (45). Robertson et al. (36) used elements of the parenting part of the Family Links Nurturing Program and of family lifestyle programs.

Results of the interventions

The results of the interventions are summarized in Table III (a and b). All studies found statistically significant intervention effects on one or more anthropometric outcome measures. For five studies, the effect sizes were calculated in terms of differences in weight change between groups, based on the information provided in the published papers. The magnitude of the effect of these studies was on average small to moderate, ranging from -0.20 – 0.60 . For the remaining two studies, which lacked an appropriate control group, the effect sizes were calculated in terms of change over time. The magnitude of the weight-related outcomes in these studies was on average moderate; with effect sizes ranging from 0.28 – 1.22 .

Four studies assessed intervention effects on energy balance-related lifestyle behaviors (physical activity, sedentary behavior and nutrition) (31,32, 35,36); all of these studies found significant positive effects on at least one of the behaviors measured. These positive effects were reported on energy intake, intake of extra food (high energy, fat, sugar, and/or salt food), time spent in small screen activities, time spent in active play, activity/inactivity balance, use of active transport to and from school, weekend-day sedentary activity, and number of steps counted. Eating and/or physical activity styles were measured

Table III. (a) Effects of interventions on anthropometric measures.

Study	Measures of overweight	Effect Sizes (Cohen's d)		
		RCR vs. C	RC vs. C	RCR vs. RC
Aragona et al. (28)	<i>12 weeks</i> Weight: Response-Cost plus Reinforcement group (RCR) lost 5.1kg; Response-Cost only group (RC) lost 4.3kg and Control group (C) gained 0.4kg. Treatment groups were significantly ^a different from the control group.	0.46	0.39	0.11
	<i>20 weeks</i> Weight: compared to baseline RCR group lost 3.6kg, RC group lost 2.3kg and C group gained 1.0kg. RCR group gained significantly less than C group; RC group not significantly different from C group.	0.42	0.31	0.19
	<i>43 weeks</i> Weight: RCR group lost 0.32kg, and RC group gained 3.3kg. Differences between these groups were not significant. Because of drop-out, the results of the C group could not be used.			0.45
Israel et al. (29)	<i>9 weeks</i> Weight: behavioral weight reduction plus Parent Training (PT) group lost 2.2kg; behavioral Weight Reduction Only (WRO) group lost 2.4kg and Waiting-List Control group (WLC) gained 2.5kg. Treatment groups were significantly different from controls, but the two treatment groups were not significantly different from each other.	PT vs. WLC	WRO vs. WLC	PT vs. WRO
	Percentage overweight: significantly lower level in WRO group (-11.64%) compared to PT children (-7.17%), and controls (0.90%).	0.37	0.58	-0.20
	Skinfold: no significant change in any of the groups. <i>One year (only PT and WRO groups)</i> Weight: significant weight increase in PT group (+5.2kg) and WRO group (+5.3kg) compared to 9 weeks; no difference in gain between the groups.			0.23
	Percentage overweight: non-significant decrease in PT group (-3.00%), significant increase in WRO group (11.92%) compared to 9 weeks. Skinfold: no significant change in any of the groups.			0.53
Israel et al. (30)	<i>26 weeks^b</i> Percentage overweight: decrease (-12.51%) in the Standard Treatment condition (ST); decrease (-15.55%) in the Enhanced Child Involvement condition (ECI). Difference between groups was not significant.	ST ^c	ECT	
	Percentage over triceps skinfold norm: reduction (-30.35%) in the ST group; reduction (-35.44%) in the ECI group. Difference between groups was not significant.	0.69	0.79	
	<i>1 year</i> Percentage overweight: decrease (-0.79%) in the ST group; decrease (-5.78%) in the ECI group. No significant effect of condition emerged.	0.51	1.22	
	Percentage over the triceps norm: reduction in the ST group (-1.82%); increase in the ECI group (+14.25%). No significant effect of condition.	0.04	0.30	
	<i>3 years</i> Percentage overweight: increase (+6.36%) in the ST group; decrease (-4.81%) in the ECI group. Difference between groups was not significant.	0.03	-0.50	
	<i>16 weeks</i> Percentage ≥ 85 th or ≥ 95 th weight for height percentile: no significant difference between groups. Weight for height z-score: decrease (-0.27) in the Obesity Prevention plus Parenting Support (OPPS) group; increase in the parenting support (PS) group (+0.31). Change showed a trend towards significance ($p = 0.06$).	0.35	0.25	
Harvey-Berino and Rourke (31)		OPPS vs. PS		

(Continued)

Table III. (a) (Continued).

Study	Measures of overweight	Effect Sizes (Cohen's d)		
Golley (32)	6 months (only P+DA and P groups)			P+DA vs. P
Golley et al. (33)	BMI z-score: significant reduction in the Parenting skills training plus intensive lifestyle education (P+DA) group (-0.22) and in the Parenting (P) group (-0.13). The difference between groups was not significant.			0.16
	Waist circumference z-score: significant reduction in both the P+DA group (-0.27) and P group (-0.12). No significant difference in change between the groups.			0.21
	12 months	P+DA vs. C	P vs. C	P+DA vs. P
	BMI z-score: reduction by 9% in the P+DA group, 6% in the P group, and 5% in the Waiting-List Control (WLC) group. The difference between groups was not significant.	0.22	0.04	0.16
	45% of children in the WLC group increased their BMI z-score, compared with 19% in the P+DA group, and 24% in the P group. This difference between groups was significant.			
	Significant group by time with gender interaction for BMI z-score. Boys in both intervention groups had a significantly lower BMI z-score at 6 and 12 months compared to baseline. For girls, the only significant time change was a reduction in BMI z-score in the WLC group.			
	Waist-circumference z-score: significant reduction in the P+DA group (-0.42) and P group (-0.27), but not WLC group (0). Waist circumference z-score was also significantly lower at 12 months compared to 6 months for the P+DA group (-0.09).	0.45	0.24	0.20
West (35)	12 weeks	LTP vs. C		
	Weight: no significant ^d change in the Lifestyle Triple P (LTP) condition (-0.21kg); significant increase in the Control (C) condition (+1.4kg). Difference between groups was significant.	0.24		
	BMI z-score: significant decrease in the LTP condition (-0.13); no significant change in the C condition (-0.02). Difference between groups was significant.	0.30		
	Waist circumference: no significant change in the LTP (-0.88 cm) or C condition (+0.59cm). Difference between groups was significant.	0.11		
	Body fat: significant decrease in the LTP condition (-4%); no significant change in the C condition (-1%). Difference between groups was significant.	0.04		
	12 months (only LTP group)	LTP ^c		
	BMI z-score: significant decrease compared to 12 weeks (-0.13) and baseline (-0.26).	0.56		
	Body fat: no significant change compared to 12 weeks (-0.76%) and baseline (-4.89%).	0.60		
Robertson et al. (36)	3 months	Study group ^c		
	BMI z-score: significant decrease (-0.18).	0.28		
	Waist z-score: significant decrease (-0.19).	0.32		
	9 months			
	BMI z-score: significant decrease (-0.21).	0.33		
	Waist z-score: significant decrease (-0.21).	0.36		

BMI = Body Mass Index, C = Control, cm = centimeters, ECI = Enhanced Child Involvement, kg = kilogram, LTP = Lifestyle Triple P, OPPS = Obesity Prevention plus Parenting Support, P = Parenting skills training alone, P + DA = Parenting skills training plus intensive lifestyle education, PS = Parenting Support, PT = Behavioral weight reduction plus Parent Training, RC = Response-Cost only, RCR = Response-Cost plus Reinforcement, ST = Standard Treatment, WLC = Wait-List Control, WRO = Behavioral Weight Reduction Only; ^aUnless stated differently, significance level $p < 0.05$; ^bResults are only reported for participants who were available both at 26 weeks and 1 year; ^cEffect sizes were calculated over time per group; ^dIn this study, the significance level is $p < 0.01$.

Table III. (b) Effects of intervention on parental and behavioral outcomes.

Study	General parenting	Parenting practices	Physical activity	Nutrition
Aragona et al. (28)	Not reported	Not reported	Not reported	Not reported
Israel et al. (29)	<p>9 weeks</p> <p>Knowledge of Behavioral Principles as applied to Children (KBPA): a scale measuring parental knowledge of social learning principles of child management. Significantly higher score in the Parent Training (PT) group compared to the Weight Reduction Only (WRO) group and controls. The WRO parents did not differ from controls.</p> <p>One year (only PT and WRO groups)</p> <p>KBPA: PT parents maintained their higher scores at follow-up relative to WRO parents (significantly different). Moreover, KBPA scores were related to changes in children's weights, with higher scores associated with less weight gain.</p>	Not reported	Not reported	<p>9 weeks</p> <p>Eating Habit Checklist (EHC): a parental report of the degree to which the child engages in the type of eating behavior recommended by a behavioral weight reduction program. Significantly higher score in the two treatment groups compared to the control condition. Treatment groups did not differ from each other.</p> <p>One year (only PT and WRO groups)</p> <p>EHC: significant decrease in both groups compared to 9 weeks. Parents of children who achieved non-obese status during treatment reported better eating habits than parents of obese children in both groups.</p>
Israel et al. (30)	Not reported	<p>26 weeks^b</p> <p>Parental control regarding weight related behaviors: significant increase in both conditions. No significant effect of condition. Parental control scores were not significantly correlated with decreases in percentage overweight during treatment.</p> <p>1 and 3 years</p> <p>Not measured</p>	<p>26 weeks^b</p> <p>Children's self-control regarding eating and activity-related behaviors: significant increase in both conditions. No significant effect of condition. This increase was significantly correlated with decreases in percentage overweight during treatment.</p> <p>1 and 3 years</p> <p>Not measured</p>	<p>26 weeks^b</p> <p>Children's self-control regarding eating and activity-related behaviors: significant increase in both conditions. No significant effect of condition. This increase was significantly correlated with decreases in percentage overweight during treatment.</p> <p>1 and 3 years</p> <p>Not measured</p>
Harvey-Berino and Rourke (31)	Not reported	<p>16 weeks</p> <p>Restrictive child feeding practices: significant decrease in the Obesity Prevention plus Parenting Support (OPPS) group; no significant change in Parenting Support (PS) group. Difference between groups was significant.</p>	<p>16 weeks</p> <p>Physical activity: no significant change in either of the groups.</p>	<p>16 weeks</p> <p>Energy intake: decrease in OPPS group (-39.2 kcal/kg per day); increase in PS group (6.8 kcal/kg per day). Difference of borderline significance ($p = 0.06$).</p> <p>Fat intake: no significant change in either of the groups.</p>

(Continued)

Table III. (b) (Continued).

<p>Golley (32) Golley et al. (33)</p>	<p>6 months (only P + DA and P groups) Parental sense of competence scale (PSOC): scale measuring parents' views of their competence as parents on two dimensions: parenting satisfaction and parenting perceived efficacy. Neither of the dimensions nor the total score PSOC changed significantly between groups over time.</p> <p>12 months PSOC, PSOC-satisfaction and PSOC-perceived efficacy did not change significantly between groups over time. All 3 PSOC items increased significantly between baseline and 12 months. This increase tended to be higher in the Parenting skills training plus intensive lifestyle education (P + DA) group and Parenting (P) group compared to the Waiting List Control (WLC) group.</p>	<p>6 months (only P + DA and P groups) Children's access to television after school and on weekends: stable over time in all groups.</p> <p>12 months Children's access to television after school and on weekends: stable over time in all groups.</p>	<p>6 months (only P + DA and P groups) Time spent engaged in small screen activities: significant reduction regardless of study group. Time spent in active play: significant increase regardless of study group.</p> <p>12 months Time spent engaged in small screen activities: significant reduction regardless of study group. Further significant reduction in using small screen devices between 6 and 12 months. Time spent in active play: significant increase regardless of study group. Active play did not significantly change between 6 and 12 months. Use of active transport to and from school: significant increase in all study groups (21% baseline to 41% 12 months).</p>	<p>6 months (only P + DA and P groups) Intake of extra food: significant reduction for the P + DA group (-1.5) and P group (-1). Intake of breads and cereals, vegetables, fruit, dairy or meat and alternatives: no significant change for any study group.</p> <p>12 months Intake of extra food: significant reduction for P + DA group (+1) and P group (+1); no significant change for the WLC group. Intake of breads and cereals, vegetables, fruit, dairy or meat and alternatives: no significant change for any study group.</p>
<p>West (35)</p>	<p>12 weeks Parenting style laxness: significant^c decrease in the Lifestyle Triple P (LTP) condition; no significant change in the control (C) condition. Difference between groups was significant (ES = 0.91). Parenting style overreactivity: significant decrease in the LTP condition; no significant change in the C condition. Difference between groups was significant (ES = 1.13). Parenting self-efficacy (confidence): significant increase in the LTP condition; no significant change in the C condition. Difference between groups was significant (ES = 1.04).</p>	<p>Not reported</p>	<p>12 weeks Weekend-day physical activity: no significant change for either of the conditions (ES = 0.54). Week-day physical activity: no significant change for either condition (ES = 0.40). Weekend-day sedentary activity: no significant change for either condition (ES = 0.62). School-day sedentary activity: no significant change for either condition (ES = 0.41). 12 months (only LTP group) Weekend-day sedentary activity: significant reduction compared to 12 weeks, but not compared to baseline (ES = 0.02).</p>	<p>12 weeks Energy intake: significant decrease (-986 kJ per 4 days) for the intervention condition, but not for the wait-list control condition (+163.3). Difference between groups was significant (ES = 0.54). 12 months (Only LTP group) Energy intake: no significant change compared to 12 weeks (+56 kJ per 4 days), but significant reduction compared to baseline (-1200 kJ per 4 days) (ES = 0.77).</p>

(Continued)

Table III. (b) (Continued).

Study	General parenting	Parenting practices	Physical activity	Nutrition
	<p>12 months (only LTP group) Parenting style laxness: no significant change compared to 12 weeks and baseline (PS = 0.31). Parenting style overreactivity: no significant change compared to 12 weeks, but significant decrease compared to baseline (ES = 0.47). Confidence: no significant change compared to 12 weeks, significant increase compared to baseline (ES = 0.97).</p>	<p>3 months Exposure to unhealthy foods in the home: significant reduction.</p> <p>9 months Exposure to unhealthy foods in the home: significant reduction.</p>	<p>Week-day sedentary activity: no significant change compared to 12 weeks and baseline (ES = 0.06). Weekend-day sedentary activity: no significant change compared to 12 weeks and baseline (ES = -0.26). Week-day physical activity: no significant change compared to 12 weeks and baseline (ES = 0.18).</p>	
Robertson et al. (36)	<p>3 months Child-parent relationship: significant improvement.</p> <p>9 months Child-parent relationship: still improved, but statistical significance was lost.</p>	<p>3 months Exposure to unhealthy foods in the home: significant reduction.</p> <p>9 months Exposure to unhealthy foods in the home: significant reduction.</p>	<p>3 months Activity/inactivity balance: children significantly less sedentary. Average minutes per day undertaking moderate to vigorous physical activity (MVPA): no significant change (+2.7). Number of steps counted: no significant change (+645 steps).</p> <p>9 months Activity/inactivity balance: reduction in sedentary behavior remained. MVPA: no significant change (+4.0). Number of steps counted: significant increase (+1571).</p>	<p>3 months Fruit and vegetable consumption: no significant change (+0.1 portions). Children's eating style: significant improvement.</p> <p>9 months Fruit and vegetable consumption: no significant change (+0.7 portions). Children's eating style: significant improvement.</p>

C = Control, EHC = Eating Habit Checklist, ES = Effect Size, KBPAC = Knowledge of Behavioral Principles as applied to Children, kcal = kilocalorie, kg = kilogram, kJ = kilo-Joule, LTP = Lifestyle Triple P, MVPA = Moderate to Vigorous Physical Activity, OPPS = Obesity Prevention plus Parenting Support, P = Parenting skills training alone, P + DA = Parenting skills training plus intensive lifestyle education, PS = Parenting Support, PSOC = Parental Sense of Competence scale, PT = behavioral weight reduction plus Parent Training, WLC = Wait-List Control, WRO = Behavioral Weight Reduction Only; ^aUnless stated differently, significance level $p < 0.05$; ^bResults are only reported for participants who were available at both 26 weeks and 1 year; ^cEffect sizes were calculated over time per group; ^dIn this study, the significance level is $p < 0.01$.

in two studies (29,30). First, Israel et al. (29) used the Eating Habit Checklist, a parental report of the degree to which the child engages in the type of eating behavior recommended by a behavioral weight reduction program, and reported a significant improvement due to the intervention. The second study (30) was one in which children's self-control regarding eating and activity-related behaviors was measured, and reported an increase in self-control in both experimental groups due to the intervention. Parenting practice measures were reported in four studies (30,31,32,36): parental control regarding weight-related behaviors was increased in both conditions in the study of Israel et al. (30), a significant decrease of restrictive child feeding practices was measured in one intervention condition (obesity prevention plus parenting support group) by Harvey-Berino and Rourke (31), children's access to television after school and on weekend days was stable over time in all conditions in the study of Golley (32), and Robertson et al. (36) reported a significant reduction of exposure to unhealthy foods in the home in their study group. Finally, the four studies that assessed general parenting (29,32,35,36) all described positive effects of the intervention on this intermediary outcome.

Discussion

Parenting has an important influence on the development of children's health in general (46), and children's weight patterns in particular (25). The current review aimed to provide an overview of interventions that address general parenting in order to prevent or treat obesity in youth. All studies showed significant small to moderate intervention effects on at least one weight-related outcome measure.

Only seven studies met the inclusion criteria for this review. However, observational studies in the field of pediatric obesity provide increasing evidence for the important role of general parenting in the development of energy balance-related behaviors and children's weight (24). A reason for this apparent discrepancy may be that observational research addressing general parenting in the area of pediatric obesity has a very short history: the first study investigating parenting style as a determinant of child weight status was published in 2000 (47), and the majority of studies were published between 2007 and 2010 (24). Papers on the evaluation of systematically designed interventions in this novel field would typically (and logically) follow these studies with a time-lag of several years.

As regards the publication year of the intervention studies included in our review, it is remarkable

that three studies were published more than 15 years ago (1975, 1985 and 1994) (28–30), whereas the other four studies were conducted recently, between 2003 and 2008 (31,32,35,36). The older studies all related to obesity *treatment*, whereas some of the more recent studies also focused on obesity *prevention*. This may reflect the early awareness of the importance of parenting among professionals working in the treatment of childhood obesity (tertiary prevention), whereas it took some years before a similar awareness arose in the area of primary and secondary prevention. Indeed, we identified several descriptive papers on ongoing preventive intervention studies (48,49, and A Vaughn, unpublished data, 2010), as well as studies registered in the International Standard Randomized Controlled Trial Number Register that report incorporating general parenting in their interventions. Furthermore, the current acknowledgement of the importance of general parenting is indicated by an increasing number of childhood prevention studies assessing parenting style as an outcome measure or as a potential moderator of the intervention effect (50–53). In addition, even though they did not explicitly address general parenting, we have come across studies that addressed the wider context in which parenting practices take place (for example emotional climate), (e.g., 21,52, 54–64).

Another reason for the observed lack of childhood obesity programs targeting general parenting may be that intervention developers are unaware or not convinced of the modifiability of general parenting. However, the intervention studies in the current review that measured parenting found large effects for this outcome measure (29,32,35,36), indicating that general parenting is indeed modifiable. Research in other fields also provides evidence for the modifiability of general parenting (65).

We found effect sizes indicating a moderate effect on one or more outcome measures in all studies; which are considered clinically meaningful. However, in a number of these studies the changes were not statistically significant. This may also reflect issues of power and measurement precision. The results highlight that further work is needed in this area before firm conclusions can be drawn. The interventions seemed to report a relatively larger effect on general parenting. Note that general parenting is a general concept, which determines the context of behavior-specific parenting. A positive change in this variable can affect the impact on a broad range of specific parenting practices, regarding multiple child outcomes (17). Changes in general parenting may therefore indicate a potentially large public health effect (65). However, it is expected that general parenting interventions are especially effective in younger children (66).

Parental influence will decrease with advancing age of their children, which makes it more difficult to intervene with these types of interventions on older adolescents. Furthermore, it is expected that parenting behaviors of parents of older children are more difficult to change because they are more likely to perform routine behaviors.

Although the content of the intervention studies included in our review varied, they did show various similarities. They all aimed to promote a parenting style that encourages instrumental competence in children by helping them balance other-oriented, rule-following tendencies with individualistic, autonomous active thinking (67). This parenting style is typically referred to as authoritative parenting (67). Second, all interventions reviewed used group sessions for parents, meaning that they are all high-intensity interventions in which parents were seen multiple times and parental interaction played a key role. Also, all intervention studies combined components of parenting styles with lifestyle education. Two studies compared an intervention primarily focusing on general parenting with an intervention aimed at general parenting as well as physical activity and nutrition components (31,32). These studies showed that interventions combining general parenting components with lifestyle components may lead to better results than interventions focusing exclusively on general parenting. Note that several studies (30,31,36) did not include a control condition that excluded the general parenting program, which makes the reported results difficult to interpret in terms of the 'true' impact of adding general parenting to the intervention content.

Some limitations of the studies included in the current review should be acknowledged. Most studies used self-reported outcome measures which may evoke social desirability bias. Another limitation of the included studies was that some tools to assess energy balance-related behaviors were not validated. Furthermore, we expected that the studies which focused on general parenting also would measure general parenting as an outcome measure. This appeared not to be the case in three studies, however. We consider this apparent lack of focus on mediating mechanisms of intervention effects as undesirable. Also, the methodological quality of the included studies varied. For example, some studies had relatively small sample sizes and a relatively short follow-up period. Some studies did not apply an RCT design, while some RCTs did not include a non-intervention control group, indicating that the study quality was heterogeneous which makes it relatively difficult to compare the studies to each other. Future studies should adopt a control condition excluding the general parenting component, and include long-term follow-up.

Evaluation models should include mediating concepts such as general parenting.

The current review indicates that the promotion of authoritative parenting is a valuable addition to childhood obesity. Given the lack of current intervention studies addressing general parenting, further development and testing of theory- and practice-based interventions is strongly recommended.

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References

1. World Health Organization (WHO). Obesity and Overweight. Geneva: WHO; 2006.
2. Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes.* 2006;1:11–25.
3. Magarey AM, Daniels LA, Boulton TJ, Cockington RA. Predicting obesity in early adulthood from childhood and parental obesity. *Int J Obes.* 2003;27:505–13.
4. Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics.* 2005; 115:22.
5. Singh AS, Mulder C, Twisk JWR, Van Mechelen W, Chinapaw MJM. Tracking of childhood overweight into adulthood: a systematic review of the literature. *Obes Rev.* 2008;9:474–88.
6. Strauss RS. Childhood obesity and self-esteem. *Pediatrics.* 2000;105:e15.
7. Must A, Strauss RS. Risks and consequences of childhood and adolescent obesity. *Int J Obes.* 1999;23(Suppl. 2):S2–11.
8. Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ. Interventions for preventing obesity in children. *Cochrane Database Syst Rev.* 2005:CD001871.
9. Oude Luttikhuis H, Baur L, Jansen H et al. Interventions for treating obesity in children. *Cochrane Database Syst Rev.* 2009:CD001872.
10. Bluford DAA, Sherry B, Scanlon KS. Interventions to prevent or treat obesity in preschool children: a review of evaluated programs. *Obesity.* 2007;15:1356–72.
11. Saunders KL. Preventing obesity in pre-school children: a literature review. *J Public Health-UK.* 2007;29:368–75.
12. Campbell KJ, Hesketh KD. Strategies which aim to positively impact on weight, physical activity, diet and sedentary behaviours in children from zero to five years. A systematic review of the literature. *Obes Rev.* 2007;8:327–38.
13. Doak CM, Visscher TL, Renders CM, Seidell JC. The prevention of overweight and obesity in children and adolescents: a review of interventions and programmes. *Obes Rev.* 2006;7:111–36.
14. Kremers SP, Visscher TL, Seidell JC, Van Mechelen W, Brug J. Cognitive determinants of energy balance-related behaviours: measurement issues. *Sports Med.* 2005;35: 923–33.

15. Nowicka P, Flodmark CE. Family in pediatric obesity management: a literature review. *Int J Pediatr Obes.* 2008;3 (Suppl. 1):44–50.
16. Young KM, Northern JJ, Lister KM, Drummond JA, O'Brien WH. A meta-analysis of family-behavioral weight-loss treatments for children. *Clin Psychol Rev.* 2007;27:240–9.
17. Kitzmann KM, Beech BM. Family-based interventions for pediatric obesity: methodological and conceptual challenges from family psychology. *J Fam Psychol.* 2006;20:175–89.
18. Epstein LH, McCurley J, Wing RR, Valoski A. Five-year follow-up of family-based behavioral treatments for childhood obesity. *JCCP.* 1990;58:661–4.
19. Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year outcomes of behavioral family-based treatment for childhood obesity. *Health Psychol.* 1994;13:373–83.
20. Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year follow-up of behavioral, family-based treatment for obese children. *JAMA.* 1990;264:2519–23.
21. Golan M. Parents as agents of change in childhood obesity – from research to practice. *Int J Pediatr Obes.* 2006;1:66–76.
22. Darling N, Steinberg L. Parenting style as context: an integrative model. *Psychol Bull.* 1993;113:487–96.
23. Maccoby EE, Martin JA. Socialization in the context of the family: parent-child interaction. *Handbook of Child Psychol.* 1983;4:1–101.
24. Sleddens EFC, Gerards SMPL, De Vries NK, Thijs C, Kremers SPJ. Impact of general parenting on childhood overweight and related health behaviors. *Int J Pediatr Obes.* 2011; 6 (2-2): e12-e27.
25. Kitzmann KM, Dalton WT, Buscemi J. Beyond parenting practices: family context and the treatment of pediatric obesity. *Family Relat.* 2008;57:13–23.
26. Cohen J. A power primer. *Psychol Bull.* 1992;112:155–9.
27. Lipsey MW. Design sensitivity: statistical power for experimental research. Newbury Park, CA: Sage Publications; 1990.
28. Aragona J, Cassady J, Drabman RS. Treating overweight children through parental training and contingency contracting. *JABA.* 1975;8:269–78.
29. Israel AC, Stolmaker L, Andrian CA. The effects of training parents in general child management skills on a behavioral weight loss program for children. *Behav Ther.* 1985;16: 169–80.
30. Israel AC, Guile CA, Baker JE, Silverman WK. An evaluation of enhanced self-regulation training in the treatment of childhood obesity. *J Pediatr Psychol.* 1994;19:737–49.
31. Harvey-Berino J, Rourke J. Obesity prevention in preschool native-American children: a pilot study using home visiting. *Obes Res.* 2003;11:606–11.
32. Golley RK. Family-focused management of overweight in pre-pubertal children – a randomised controlled trial. The healthy eating and lifestyle through positive parenting (HELPP) study. School of Medicine, Flinders University; 2005.
33. Golley RK, Magarey AM, Baur LA, Steinbeck KS, Daniels LA. Twelve-month effectiveness of a parent-led, family-focused weight-management program for prepubertal children: a randomized, controlled trial. *Pediatrics.* 2007;119: 517–25.
34. Golley RK, Perry RA, Magarey A, Daniels L. Family-focused weight management program for five-to nine-year-olds incorporating parenting skills training with healthy lifestyle information to support behaviour modification. *Nutrit Dietetics.* 2007;64:144–50.
35. West F. The Lifestyle Triple P Project. Exploring the link between parenting and childhood obesity. University of Queensland; 2007.
36. Robertson W, Friede T, Blissett J, Rudolf MCJ, Wallis M, Stewart-Brown S. Pilot of 'Families for Health': community-based family intervention for obesity. *Arch Dis Child.* 2008; 93:921–28.
37. Patterson GR, Gullion ME. Living with children: new methods for parents and teachers. Champaign, IL: Research Press; 1968.
38. Patterson GR. Living with children: new methods for parents and teachers (Revised). Champaign, IL: Research Press; 1976.
39. Skinner BF. Science and human behavior. New York: Free Press; 1965.
40. Bandura A. Social learning theory of aggression. In: Knutson JF, editor. Control of aggression: implications from basic research. Chicago: Adline Publishing Co.; 1971. pp 201–50.
41. Sanders MR, Markie-Dadds C, Turner KMT. Theoretical, scientific and clinical foundations of the Triple P-Positive Parenting Program: a population approach to the promotion of parenting competence. *Parenting Res Pract Monogr.* 2003;1:1–24.
42. Patterson GR. Coercive family process. Eugene, OR: Castalia Press; 1982.
43. Mullis F. Active parenting: an evaluation of two Adlerian parent education programs. *JIP.* 1999;55:225–32.
44. Hunt C. The parenting puzzle: how to get the best out of family life. Oxford, UK: Family Links; 2003.
45. Barlow J, Stewart-Brown S. Understanding parenting programmes: parents' views. *Prim Health Care Res Dev.* 2006; 2:117–30.
46. Waylen A, Stallard N, Stewart-Brown S. Parenting and health in mid-childhood: a longitudinal study. *Eur J Public Health.* 2008;18:300–5.
47. Gable S, Lutz S. Household, parent, and child contributions to childhood obesity. *Family Relat.* 2000;49:293–300.
48. Daniels LA, Magarey A, Battistutta D et al. The NOURISH randomised control trial: positive feeding practices and food preferences in early childhood – a primary prevention program for childhood obesity. *BMC Public Health.* 2009; 9:387.
49. Wolman J, Skelly E, Kolotourou M, Lawson M, Sacher P. Tackling toddler obesity through a pilot community-based family intervention. *Community Pract.* 2008;81:28–31.
50. Stark LJ, Spear S, Boles R et al. A pilot randomized controlled trial of a clinic and home-based behavioral intervention to decrease obesity in preschoolers. 2011 Obesity (Silver Spring);19:143–41. (DOI: 10.1038/oby.2010.87).
51. Stein RI, Epstein LH, Raynor HA, Kilanowski CK, Paluch RA. The influence of parenting change on pediatric weight control. *Obes Res.* 2005;13:1749–55.
52. Golan M, Kaufman V, Shahar DR. Childhood obesity treatment: targeting parents exclusively v. parents and children. *Brit J Nutr.* 2006;95:1008–15.
53. Shelton D, Le Gros K, Norton L, Stanton Cook S, Morgan J, Masterman P. Randomised controlled trial: a parent-based group education programme for overweight children. *J Paediatr Child Health.* 2007;43:799–805.
54. Epstein LH, Gordy CC, Raynor HA, Beddome M, Kilanowski CK, Paluch R. Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. *Obes Res.* 2001;9:171–8.
55. Epstein LH, McKenzie SJ, Valoski A, Klein KR, Wing RR. Effects of mastery criteria and contingent reinforcement for family-based child weight control. *Addict Behav.* 1994; 19:135–45.
56. Epstein LH, Paluch RA, Raynor HA. Sex differences in obese children and siblings in family-based obesity treatment. *Obes Res.* 2001;9:746–53.
57. Epstein LH, Wing RR, Koeske R, Valoski A. A comparison of lifestyle exercise, aerobic exercise, and calisthenics on weight loss in obese children. *Behav Ther.* 1985;16:345–56.

58. Flodmark CE, Ohlsson T, Rydén O, Sveger T. Prevention of progression to severe obesity in a group of obese school-children treated with family therapy. *Pediatrics*. 1993;91:880–4.
59. Golan M, Fainaru M, Weizman A. Role of behaviour modification in the treatment of childhood obesity with the parents as the exclusive agents of change. *Int J Obes*. 1998;22:1217–24.
60. Golan M, Weizman A, Apter A, Fainaru M. Parents as the exclusive agents of change in the treatment of childhood obesity. *Am J Clin Nutr*. 1998;67:1130–5.
61. Janicke DM, Sallinen BJ, Perri MG et al. Sensible treatment of obesity in rural youth (STORY): design and methods. *Contemp Clin Trials*. 2008;29:270–80.
62. Kalarchian MA, Levine MD, Arslanian SA et al. Family-based treatment of severe pediatric obesity: randomized, controlled trial. *Pediatrics*. 2009;124:1060–8.
63. Nowicka P, Pietrobelli A, Flodmark CE. Low-intensity family therapy intervention is useful in a clinical setting to treat obese and extremely obese children. *Int J Pediatr Obes*. 2007;2:211–7.
64. Nowicka P, Høglund P, Pietrobelli A, Lissau I, Flodmark CE. Family Weight School treatment: 1-year results in obese adolescents. *Int J Pediatr Obes*. 2008;3:141–7.
65. Spoth R, Redmond C, Shin C. Direct and indirect latent-variable parenting outcomes of two universal family-focused preventive interventions: extending a public health-oriented research base. *JCCP*. 1998;66:385–99.
66. Stice E, Shaw H, Marti CN. A meta-analytic review of obesity prevention programs for children and adolescents: the skinny on interventions that work. *Psychol Bull* 2006; 132:667–91.
67. Baumrind D. Parental disciplinary patterns and social competence in children. *Youth Soc*. 1978;9:239–76.