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Childhood obesity treatment: targeting parents exclusively *v.* parents and children

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There is a consensus that interventions to prevent and treat childhood obesity should involve the family; however, the extent of the child's involvement has received little attention. The goal of the present study was to evaluate the relative efficacy of treating childhood obesity via a family-based health-centred intervention, targeting parents alone *v.* parents and obese children together. Thirty-two families with obese children of 6–11 years of age were randomised into groups, in which participants were provided for 6 months a comprehensive educational and behavioural programme for a healthy lifestyle. These groups differed in their main agent of change: parents-only *v.* the parents and the obese child. In both groups, parents were encouraged to foster authoritative parenting styles (parents are both firm and supportive; assume a leadership role in the environmental change with appropriate granting of child's autonomy). Only the intervention aimed at parents-only resulted in a significant reduction in the percentage overweight at the end of the programme ($P=0{\cdot}02$) as well as at the 1-year follow-up meeting. The differences between groups at both times were significant ($P<0{\cdot}05$). A greater reduction in food stimuli in the home ($P<0{\cdot}05$) was noted in the parents-only group. In both groups, the parents' weight status did not change. Regression analysis shows that the level of attendance in sessions explained 28 % of the variability in the children's weight status change, the treatment group explained another 10 %, and the improvement in the obesogenic load explained 11 % of the variability. These results suggest that omitting the obese child from active participation in the health-centred programme may be beneficial for weight loss and for the promotion of a healthy lifestyle among obese children.

Childhood obesity: Family-based interventions: Parents-only interventions

To reduce the epidemic of childhood obesity, environmental factors should be altered (Hill & Peters, 1998). Targeting obese children for education to create a healthy lifestyle, modification of eating habits, and reduction of sedentary behaviour appears to be the most effective intervention for both achieving and maintaining weight loss (Epstein *et al.* 1995; Glenny *et al.* 1997; Summerbell *et al.* 2003). Although most treatments include a dietary component, it is generally recognised that nutritional intervention alone is ineffective as the sole treatment for childhood obesity. Epstein *et al.* (1980) demonstrated that adding behavioural techniques of contingency contracting, self-monitoring of energy intake and weight, praise, and stimulus control, to nutrition education, significantly improved the reduction in percentage of overweight compared with nutrition education alone over a 5-month period ($-17{\cdot}5$ *v.* $-6{\cdot}4$ %). It was also demonstrated that focusing on increasing the intake of healthy foods was a useful approach for nutritional changes for parents and their obese children, rather than avoiding intake of high-fat–high-sugar foods. (Epstein *et al.* 2001) The same results were shown in an intervention programme conducted in schools to improve health-related behaviours (Muller *et al.* 2001). Children in the experimental schools showed greater effects on the age-dependent change in fat mass compared with children in the control group.

There is a consensus that interventions to prevent and treat childhood obesity should involve the family; however, the preferred role of parents is unclear (Glenny *et al.* 1997; Dietz & Gortmaker, 2001). Glenny *et al.* (1997) suggested that there may be some benefit in behavioural therapy when parents are involved in the child's weight-loss efforts. Epstein *et al.* (1990) reported that when parents and children were targeted together for weight loss, children in the child and parent group achieved a greater decrease in their percentage overweight after 5 and 10 years than children in the non-specific control group, whereas children in the child-only group showed increases in percentage overweight. Another approach studied by Israel *et al.* (1994) compared children's management of their own weight loss with parents' management of their children's weight loss. Parental responsibility for the completion of homework assignments and motivation of their children was compared with enhanced child involvement, where the children were trained in self-management techniques. Both groups lost weight, but no statistical group effect was detected.

While several authors have studied parental involvement, it is unclear how much involvement by the child is needed.

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We developed a programme in which children were not directly involved in the intervention, to study whether they need to be included in treatment or can be omitted from direct intervention. This option was suggested in light of the indications that parental behaviour plays an important part in childhood obesity; children often resist change and express it by rebelling and acting oppositionally when they are subjected to such demands. Moreover, when there are multiple agents of change, responsibility for change may be unclearly assigned; namely, parents may feel that the child is responsible for the change, while the child leaves the responsibility to the parents, resulting in no change at all. The parents-only programme also has the potential cost–benefit of treating just the parents *v.* the parents plus child. Moreover, there are certain indications in the literature suggesting a connection between dieting and preoccupation with food and weight by children and adolescents (Patton *et al.* 1990; Thompson *et al.* 1995); thus, modifying the environment without involving offspring in the intervention may be preferable.

Our previous studies demonstrated that when parents were targeted as the primary mediators of change, children aged 6–11 years showed greater weight loss, an increase in the number of behavioural changes, and better retention of these changes (Golan *et al.* 1998*b*,*c*). In these studies parents served as both a source of authority and a role model for their children. Parents regulated the quality and pattern of the food environment (more fruit and vegetables and less high-sugar, high-fat foods), providing an environment with fewer obesogenic factors and more self-regulation and healthy practice (more physical activity and less sedentary activity). They set limits when appropriate and, by their behaviours and attitudes, served as role models for their offspring (Golan *et al.* 2001).

Previous studies examined the efficacy of interventions targeting the obese child alone *v.* the parents alone (Golan *et al.* 1998*a*,*b*,*c*). The question remains, which is better: parents-only or parent and child treatment? The present study extends this knowledge by comparing targeting parents and child *v.* parents alone, to address the question: Do the children need to be involved at all?

Subjects and methods

Subjects and procedures

Of the 102 families who replied to an advertisement in the local press, thirty-two met the following criteria: children 6–11 years of age; children more than 20 % overweight (BMI for age and sex over 85th percentile); parents agree to attend programme meetings; no current participation of any family member in a weight-loss programme; no restriction regarding participation in a physical activity programme for children and parents; no diagnosis of psychiatric or major endocrine pathology.

Before participants entered the study they agreed to random treatment assignments. The thirty-two families had signed an informed consent and then the children were divided into three age groups: children aged 6 and 7 years; children aged 8 and 9 years; children aged 10 and 11 years. The participants from each age group were randomised into the research groups. The process was carried out by using two concealed opaque envelopes indicating group 1, namely parents-only, or group 2, parents and children. Allocation was concealed from those recruiting. When two siblings from one family participated, they were both assigned to the same group.

The allocation scheme is shown in Table 1. Two families who were allocated to the parents–children group had two children, and three families with two children were allocated to the parents-only group. After randomisation, two families refused to participate in the parents-only group, and one family refused to participate in the parent and child group. One family dropped out after 2 weeks because of a car accident. One child was omitted from the parents-only group because of hypothyroidism, which was discovered 2 weeks after the programme started. All those who terminated the study attended the follow-up meeting. After allocation, there was no difference in children's sex and BMI status between the groups. Thirty-two mothers and twenty-seven fathers participated in the programme; two mothers were widows, three were divorced and the fathers were not interested in participating in the study. The data were gathered by an MSc student who was blinded to the treatment allocation, and the analysis was performed by a professional statistician at the university statistics department.

The Ethics Committee for Human Experimentation at Kaplan Hospital (Rehovot, Israel) approved the research protocol. All parents signed an informed consent form.

Intervention structure

Sixteen 1 h support and education group sessions were held for each group. The first ten sessions were held weekly, the next four biweekly, and the last two, once per month. Overall, the programme lasted 6 months. In addition, 40–50 min individual appointments were held once per month for each family in both groups, during the 6 months of the programme.

Table 1. Allocation scheme of the study participants

Group	Parents only (*n*)	Parents and child (*n*)
Families	14	18
Families with two children in the programme	3	2
Mothers	14	18
Fathers	12	15
Children	17	20
Drop-out total	4	1
Refusal	2	1
Car accident	1	–
Hypothyroidism	1	–

A follow-up meeting and anthropometric measurement were conducted 12 months after the programme's termination.

A clinical dietitian, supervised by a family therapist, administered the programme. Both programmes were similar in content; however, the programme for the parents and children group was adapted to fit the children included (the same issues were discussed in a different manner).

In the parents-only group, only parents attended the programme sessions. However, all suggested changes were intended for the entire family as was described elsewhere by Golan *et al.* (2001).

In the parents and children group, both parents and their obese child attended the group sessions together. In this group shared activities and discussions were planned to address the topics. If the topic was modelling, for instance, the group facilitator may have asked children to describe a behaviour which is similar to their parents. The discussion might have included questions such as: why do you feel it is important to behave in this manner? How do you feel about behaving like your father? What does that say about your value? Then, the same questions were directed to the appropriate father.

Programme orientation

A family-based, health-centred orientation was implemented. The programme emphasised healthy eating patterns (decrease exposure to obesogenic foods, establish designated times for family meals, set at least one family meal per day, allocate individual portions, etc), encouraged an increase in daily physical activity (a goal of 4 h/week), and a decrease in sedentary behaviours (<3 h/d). Self-monitoring of food intake as well as types and amount of activities were introduced three times: at baseline, at 6 months and at 12 months. Parents in both groups were trained in coping techniques in order to encourage and foster an authoritative feeding style. Authoritative parents provide clear and firm direction for their children, but disciplinary clarity is moderated by warmth, reason, flexibility and verbal give-and-take. They are assertive, but not intrusive and restrictive. An authoritative feeding style is one in which adults determine which foods are offered, and children determine the amount eaten.

Parents were also encouraged to de-emphasise thinness and focus on addressing their and the child's internal needs by expressing feelings and nurturing the child emotionally. The model, which was developed by M. G. and has been described in detail elsewhere (Golan *et al.* 2001), guided the content of the sessions.

Programme protocol

The first three sessions focused on nutrition education and parental modelling. In the next two sessions, the use of an authoritative feeding style was discussed. Parents largely control the child's eating environment, provide companionship at meal times and promote family meals. Therefore, parents were encouraged to model healthy food selection, decrease sedentary behaviour and increase physical activity.

Sessions 6 and 7 focused on eating and activity behaviour modification, reinforcing means to influence a child's food preferences, as well as employing behaviour modification. The use of bribes, food rewards or eliminations, and regulating the children's food intake were announced as counterproductive.

Sessions 8 and 9 focused on problem solving while implementing the change in the home.

Sessions 10 and 11 dealt with cognitive restructuring and media management.

Session 12 focused on coping with resistance.

In the remaining four sessions, groups discussed their successes and difficulties, as well as recommendations on how to work around constraints imposed on parents in order to promote a healthy lifestyle for all family members.

Measurements

Anthropometric measurements (child and both parents) were performed at baseline, at programme termination (after 6 months), and 12 months after programme termination. Weight and height were measured to the nearest 0·1 kg and 1 cm, respectively, using a standard medical balance-beam scale with a rigid vertical height rod (Shekel Scales, Tel Aviv, Israel). Subjects (parents and children) were weighed once per month, while wearing light clothing and no shoes.

Children's overweight was calculated by this formula: (children's current BMI – children's 50th percentile BMI)/ children's 50th percentile BMI $\times$ 100.

Children's BMI *Z* scores were calculated based on the LMS method (Cole *et al.* 2000). This method enables the use of an internationally acceptable definition of child overweight and obesity, specifying the measurement, reference population, and age- and sex-specific cut-off points. Adult overweight was defined by BMI >25 kg/m^2 (World Health Organization, 1998). Overweight percentage in adults was calculated by dividing the current BMI by 25.

Parents in both groups completed the Family Eating and Activity Habits Questionnaire (Golan *et al.* 1998*b*) at the beginning and termination of the programme. This questionnaire measures the obesogenic factors in the environment (eight items), physical activity (four items), the relationship of eating to hunger (four items), and the eating habits of the obese child and his parents (thirteen items). Mean *r* for Cronbach's α was 0·83 (internal consistency). The total score for test–retests Pearson correlation coefficient was *r* 0·85 ($P<0·01$) (Golan *et al.* 1998*b*). The total family score was higher in families with an obese child compared with families with a normal-weight child ($P<0·01$), thus indicating its validity (Golan *et al.* 1998*b*).

Parenting style was measured using The Parental Authority Questionnaire (Buri *et al.* 1988; Buri, 1991), which measures Baumrind's permissive, authoritarian, and authoritative parental authority prototypes (Baumrind, 1971).

Statistical analysis

Statistical analysis used the Statistical Analysis System (SAS Institute Inc., Cary, NC, USA). The study was designed to detect differences of 10 % weight loss with a power of 90 % and a significance level of 0·05, given a dropout rate of 10 % with a sample of twelve in each group, based on variation defined in a previous study by Golan *et al.* (1998*c*).

One-way ANOVA with Bonferroni's tests to correct for multiple comparisons were conducted to explore between-group differences at baseline for parents' and children's data.

Group differences in percentage overweight and BMI *Z* score were analysed using mixed model repeated-measures ANOVA, with treatment group as the between factor, and time (0, 6, 18 months) as the within factor, with linear contrasts used to follow significant main effects or interactions. It was an intention to treat analysis where the missing values were replaced with baseline values.

Changes in lifestyle behaviours from baseline to the end of the intervention (after 6 months) were assessed using χ^2 tests, *t* tests and analysis of covariance.

Pearson's correlation coefficients were used to determine associations between numerical variables. *P* values of $<0{\cdot}05$ were considered statistically significant.

A multiple stepwise regression analysis was performed to test the contribution of the different variables to the change in the child's weight status at programme termination (6 months). The dependent variable was the change in the child's BMI *Z* score; the independent factors were the treatment group, mother's baseline BMI, which was found to be correlated with the child's change in weight status; the child's baseline BMI; change in the obesogenic load at home (change in the family eating and activity habits questionnaire); change in children's physical and sedentary activity; change in exposure to stimulus; level of attendance in sessions of the agents of change; change in energy intake.

Results

Characteristics of both groups at baseline are presented in Table 2. No statistically significant differences between the groups were detected in any of the baseline characteristics measured, including socio-economic status.

Table 2. Participant characteristics at baseline
(Mean values and standard deviations)

	Parents-only group		Parent and child group		
	Mean	SD	Mean	SD	*P* *
Children					
Girls (*n*)	10		10		
Boys (*n*)	7		10		
Age (years)	8·75	1·9	8·7	2	NS
Height (cm)	138·7	11·8	135·4	10·8	NS
Weight (kg)	47·1	12·4	45·5	15·9	NS
BMI (kg/m^2)	24·2	3·0	24·3	3·6	NS
Mean overweight percentage	47·0	22·1	48·5	18·1	NS
Mothers					
n	14		18		
Age (years)	38	4·4	40·1	6·1	NS
Height (cm)	162·6	6·4	162·4	5·8	NS
Weight (kg)	72·7	11·1	79·1	15·5	NS
BMI (kg/m^2)	27·5	3·7	30·1	6·7	NS
Mean overweight percentage	22·2	16·9	33·5	28·4	NS
Fathers					
n	12		15		
Age (years)	38·7	5·1	42·5	5·2	NS
Height (cm)	173·4	7·4	173·5	7·2	NS
Weight (kg)	100·9	24·7	102·3	19·1	NS
BMI (kg/m^2)	33·4	7·3	33·9	5·45	NS
Mean overweight percentage	45·4	32·3	47·4	24·3	NS

* Probability of differences between the groups was analysed by *t* test.

Attendance rate

Full attendance was defined when all agents of change were present in the sessions (for child and parents group, three subjects; for parents-only group, one or two subjects depending on family structure).

Partial attendance was defined when only one parent was present in the session.

In the parents-only group a full attendance was observed in 80 % of the sessions, partial attendance was observed in 15 % of the sessions, 5 % absence; an average of 86 % attendance.

In the parent and child group a full attendance was observed in 55 % of the sessions, partial attendance was observed in 38 % of the sessions, 7 % absence; an average of 83 % attendance.

Weight loss

The change in percentage overweight and change in BMI during the study period and at the 18-month follow-up meeting are shown in Fig. 1.

At the end of intervention the treatment effect was statistically significant with regard to the parents-only group. Overweight change was $-9{\cdot}5$ % (0·4 BMI *Z* score; $P=0{\cdot}003$) in the parents-only group *v.* $-2{\cdot}4$ % (0·1 BMI *Z* score) in the parents–children group. The difference between the groups was statistically significant for both changes in percentage overweight and BMI *Z* score ($F_{(1,28)}=11{\cdot}3$, $P=0{\cdot}02$; $F_{(1,28)}=5{\cdot}7$, $P=0{\cdot}024$, respectively). No differences in children's height were shown between the groups.

A non-obese status was reached at termination by two children from the parents-only group and one child from the parents–children group. No associations were shown between percentage weight change and sex or age.

The percentage overweight of both mothers and fathers did not change significantly at the end of the programme in either group ($F_{(1,26)}=2{\cdot}9$, $P=0{\cdot}1$; $F_{(1,23)}=2{\cdot}0$, $P=0{\cdot}2$, respectively).

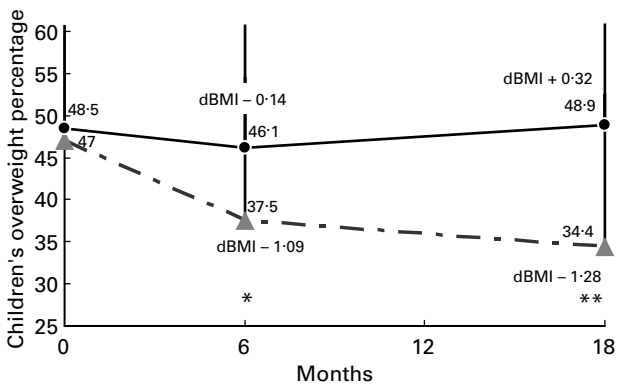

Fig. 1. Children's weight status at baseline, termination (6 months), and 1-year follow-up, and change in BMI (dBMI; kg/m^2) at treatment termination and 1-year follow-up. (–●–), Parent and child group; (–▲–), parents-only group. Values are means and standard deviation. Mean value was significantly different from that of the parent and child group: *$P<0{\cdot}02$, **$P<0{\cdot}05$.

At the 1-year follow-up meeting, an average reduction of 12 in percentage overweight and 0·5 BMI *Z* score was observed in the parents-only group ($P=0·045$; $P=0·025$, respectively) *v.* a 0·4 increase in the average percentage overweight status and 0·1 BMI *Z* score among children from the parents–children group (NS) (Fig. 1).

The repeated-measurement analysis which assessed the change over time (0, 6, 18 months) indicated significant difference in children's percentage overweight and BMI *Z* scores between the groups ($F_{(2,56)}=10·7$, $P<0·01$; $F_{(2,56)}=5·9$, $P=0·005$, respectively) with significant group × time interaction on both percentage overweight and BMI *Z* scores ($F_{(2,56)}=7·5$, $P=0·001$; $F_{(2,56)}=3·9$, $P=0·02$, respectively). Significant linear trends in both BMI *Z* scores and overweight change were detected ($P=0·01$). No differences in children's height were shown between the groups. In order to rule out 'family' effects due to the participation of siblings in the present study the analyses were carried out with and without these families; two families in the parents and child group and three in the parents-only group. Both ways resulted in statistically significant changes in children's percentage overweight and BMI *Z* score between the groups ($F=8·9$, $P<0·01$; $F=5·3$, $P=0·03$, respectively).

Behavioural changes

Changes in the children's eating and activity patterns from baseline to 6 months are presented in Table 3 (eating and activity patterns were not measured at the 18 months visit). Both groups increased their physical activity and decreased the time spent in sedentary behaviours, as well as episodes of eating between meals. A statistically significant difference between the groups was found only in respect to the exposure of children to the presence of food stimulus at home ($P=0·03$). Those parents whose children were not actively targeted by the programme reported less use of snacks, sweets, ice cream, and cakes at home.

A 22 % reduction in the overall obesogenic habits in the house, reported by child and parents (change in the Family Eating and Activity Habits Questionnaire scores from baseline to 6 months), was found ($P<0·01$) after the intervention in the parents-only group, while only a 15 % reduction was found in the parent and child group ($P=0·02$). The differences between the groups in the questionnaire total score were found to be statistically significant ($P<0·05$).

Weight loss was negatively correlated with the rate of mothers' offering food to the child (r 0·3; $P<0·01$) and positively with the level of physical activity (r 0·6; $P<0·03$).

Parenting style

In both groups the parenting style did not change significantly. A statistically significant negative correlation was shown between permissive parenting style and changes in BMI in both groups (−0·6, $P<0·01$ for the parents-only group; −0·58, $P<0·03$ for the parent and child group); the more permissive the mother, the less change occurred in the child's BMI.

Permissive parents are more responsive than they are demanding. They essentially allow children to make their own decisions and regulate their own activities. These parents set boundaries more similar to friendship with their children, with minimal punishment when things go wrong. Permissive parenting is linked to lower levels of self-regulatory skills.

A trend was shown in the correlation coefficient between the changes in authoritative style (measured by the parenting-style questionnaire) and child weight loss (r 0·4; $P=0·08$). Improvement in parental authoritative style (parents provide clear and firm direction for their children, but moderate disciplinary clarity by warmth, reason, flexibility, and verbal give-and-take; parents are assertive, but not intrusive and restrictive) tended to be associated with more weight reduction in children.

Regression analysis

The regression model is presented in Table 4. In the multiple stepwise regression analysis using the reduction in child's BMI *Z* score at the end of the 6-month intervention as the dependent variable, 49 % of the variability of the child's weight status was explained by three factors. The level of attendance in sessions explained 28 % (r^2 0·28; $P<0·003$) of the variability, the treatment group explained another 10 % of the variability (r^2 0·38; $P<0·04$), and the

Table 3. Children's overweight status, eating and activity patterns, food stimuli at home and total eating pattern score at baseline and after 6 months in the programme

(Mean values and standard deviations)

	Parents-only group					Parent and child group				
	Baseline		Termination			Baseline		Termination		
	Mean	SD	Mean	SD	Change	Mean	SD	Mean	SD	Change
BMI *Z* score†	2·0		1·6		0·4*	2·1		2·0		0·1
Overweight percentage†	47·0	22·1	37·5	22·0	−9·5*	48·5	18·1	46·1	17·8	−2·4
Physical activity (h/d)	3·4	1·9	4·5	1·7	+1·2*	4·0	1·6	5·0	1·7	+1·0*
Television viewing (h/d)	3·8	1·2	3·0	1·4	−0·8*	3·9	1·2	2·9	1·3	−1·0*
Eating between meals (score)	2·9	0·6	1·8	0·7	−1·1**	2·3	0·7	1·8	0·4	−0·5*
Added extra (units)	3·3	0·8	2·6	0·7	−0·7*	3·3	1·0	3·1	0·8	−0·3
Food stimuli (items)†	14·5	4·3	5·2	2·7	−9·3**	12·7	3·5	6·6	3·2	−6·1**
Obesogenic load (total score)†	30·1	7·7	23·5	7·3	−6·6**	28·9	6·9	24·6	4·1	−4·3*

Within a group, the change was significant: * $P<0·05$, ** $P<0·01$.
† The difference between the groups at the end of the intervention was significant ($P<0·05$).

Table 4. The contribution of selected behaviours to the variability in BMI *Z* score using three steps of the hierarchic regression

Independent variables	Adjusted R^2	*P*	*t*	β	SE B	B
Step 1						
Attendance in sessions	0·28	0·003	3·26	0·53	0·158	0·514
Step 2						
Attendance in sessions	0·38	0·008	2·88	0·45	0·153	0·439
Treatment group		0·04	2·09	0·33	2·34	4·9
Step 3						
Attendance in sessions		0·005	3·08	0·45	0·14	0·435
Treatment group	0·49	0·018	2·52	0·37	2·18	5·49
Improvement in obesogenic load		0·028	−2·33	−0·33	2·82	−6·58

improvement in obesogenic load in the house explained another 11 % of the variability (r^2 0·49; $P<0·02$). Baseline BMI of the mother, baseline BMI of the child, as well as sex, were included in a prior step of the regression model, although none of these values entered into the final model.

Discussion

In a previous study, we demonstrated the efficacy of parental intervention over a child-focused intervention for childhood obesity (Golan *et al.* 1998*c*). The question remained whether the child's attendance is needed in treatment. Is parental intervention *per se* sufficiently efficacious or is dual intervention superior? The present study addresses this issue.

The present study demonstrates that children aged 6–11 years who attended healthy lifestyle intervention sessions with their parents lost less weight than those children whose parents were the main mediators and who did not attend the sessions. It confirms previous data (Golan *et al.* 1998*c*) showing that children who actively participate in behaviour-modification sessions demonstrated less weight reduction and behavioural changes when compared with children who did not attend these sessions.

The present study is the first to demonstrate that omitting the child from attendance in intervention sessions has the advantage of more weight loss compared with sessions in which the parents and child both attend. It is important to note at this point that the positive effect of the parents-only group may be underestimated. Given the propensity, in observational studies, for overweight children to become more overweight with time, it is possible that the parent and child intervention was somewhat effective – i.e. the children in this group might have had greater BMI gains without the intervention. If this were the case, the impact of the parents-only group could be underestimated in the present study.

The disadvantage of the children's presence in the intervention sessions might be attributed to the conflict they face when lifestyle changes are demanded. Lerner & Lerner (1983) suggested that children often resist change and express it by rebelling and acting appositively when they are subjected to such demands. Mendonca & Brehm (1983) evaluated the role of perception of choice in the therapeutic outcome of behavioural obesity treatment. Children who perceived that they chose the type of treatment lost more weight than children in the no-choice control group, when interviewed at the 12-week marker.

One of the study limitations is the lack of a third condition where parents and children are targeted separately. Another limitation stems from the differences in the refusal rates between the groups. In the parents-only group two individuals refused to participate, while in the parents and children group only one family refused to participate. These differences are quite small, although it may indicate the difficulties in recruitment to parents-only intervention when dealing with childhood obesity.

Epstein and colleagues demonstrated that a weight-reduction-oriented programme that targeted both the parents and children with information given in separated groups demonstrated superiority over the child-alone condition. It was suggested that children are less inhibited, and thus participate more actively, when separated from their parents. Additionally, children behave more responsibly and are better controlled when they are treated separately from their parents (Israel *et al.* 1985).

One might think that targeting parents without or separately from their children extends the topics that can be addressed in the intervention sessions. Targeting parents for improvement of parenting skills in the treatment of childhood obesity is widely supported by existing research (Epstein *et al.* 1981, 1998; Israel *et al.* 1985; Epstein, 1996; Barlow & Dietz, 1998).

Israel *et al.* (1985) found that at the 1-year follow-up, children whose parents had participated in a short course in general behaviour management had significantly better weight control than did children in an intervention that focused solely on weight reduction.

Our model focuses on environmental changes as well as on role modelling by the parents. The parents-only group showed a significant improvement in reduction of overall obesogenic habits in the house compared with the parent and child group. These changes in the obesogenic factors in the child's environment explained 11 % of the variance in the improvement of children's weight status according to the regression model. Stepwise regression analyses have also shown that the level of attendance of the agent of change in sessions explained 28 % of the variability, and the treatment group explained another 10 % of the variability in the children's weight status.

The attendance data demonstrate a higher full attendance (both parents) in the parents-only group while in the parent and child condition, a higher partial attendance was demonstrated. This may suggest that when more subjects are responsible for a topic, there is more place for concession or

indulgence, followed by influence on outcome as reflected by the regression analysis.

In the present study, parent modelling was not found to be a mechanism responsible for the better effects in the parents-only group. However, one must not ignore this path of learning that has proved effective in many studies.

In our intervention, parents were encouraged to practise authoritative, or cooperative, feeding styles. In this practice, adults determine which foods are offered, and children determine the amount eaten. This paradigm is believed to result in optimum outcomes in children (Satter, 1988), due partially to the development of their self-control (Birch & Davidson, 2001).

In contrast to regulating the environment as we suggest, Johnson & Birch (1994) found that controlling a child's feeding practices most probably contributes to, rather than prevents, childhood obesity and eating problems. Parental control interferes with a child's ability to attend to internal cues of hunger and satiety that serve self-regulation (Birch & Davidson, 2001). Many parents of obese children control the child's behaviour rather than regulate the obesogenic factors in the home environment. Authoritative parents take responsibility and enforce a healthy environment in the house, set limits on the time spent by the child with regard to sedentary activity, and avoid insensitivity and/or unresponsiveness to the feeding cues from the child. According to Satter's trust model (Satter, 1996), it is assumed that children will eat the amount they need.

The present study only partially confirmed this hypothesis, probably due to the small sample size and the lack of statistical power. In both groups no change in parenting style was observed. However, a trend of statistically significant correlation was found between parental control and child weight loss (r 0·4; $P=0·08$) and negative correlation was shown between liberal parenting style and changes in BMI for mothers only. More research is needed to evaluate change in parenting style and its importance in such programmes.

The family-based health-centred approach suggested here is most suitable for young children, since they are more amenable to change. However, it can also benefit older children, as well as their parents, since they are all part of the environment that is targeted for change. The suggested intervention may be particularly well suited for families in underserved rural communities where parents have limited information and exposure to health promotion strategies; thus children are at greater risk for obesity. The difficulties faced by therapists in the parents-only approach are related mainly to parents' motivation. It is easier said than done for parents to take responsibility on what is considered to be the child's problem. This might be presented in the form of resistance to participate in such an intervention. Studying how to enhance parents' motivation to change the obesogenic environment might be useful in future studies. Further studies should explore the efficacy of the parents-only group compared with parent and children groups in which the parents and the children are treated separately.

Conclusions

Targeting the health-centred approach to childhood obesity with the parents as the exclusive mediator, addressing parenting at least as much as lifestyles, resulted in better results than the situation where parents attended sessions with the obese child. Attendance rate, reduction in obesogenic load and treatment group were the main predictors for success.

It is essential to encourage healthcare professionals to address the epidemic of obesity and eating disorders with family-based healthy lifestyle programmes rather than weight-reduction orientation.

References

Barlow SE & Dietz WH (1998) Obesity evaluation and treatment: Expert Committee Recommendations. *Pediatrics* **102**, 1–11.

Baumrind D (1971) Current patterns of parental authority. *Dev Psychol Monogr* **4**, 101–103.

Birch LL & Davidson KK (2001) Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatr Clin N Am* **48**, 893–907.

Buri JR (1991) Parental authority questionnaire. *J Pers Assess* **57**, 110–119.

Buri JR, Louiselle PA, Misukanis TM & Mueller RA (1988) Effects of parental authoritarianism and authoritativeness on self esteem. *Pers Soc Psychol* **14**B, 271–282.

Cole TJ, Bellizzi MC, Flegal KM & Dietz WH (2000) Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* **320**, 1240–1243.

Dietz WH & Gortmaker SL (2001) Preventing obesity in children and adolescents. *Annu Rev Publ Health* **22**, 337–353.

Epstein LH (1996) Family-based behavioral intervention for obese children. *Int J Obes* **20**, Suppl. 1, S14–S21.

Epstein LH, Constance CG, Hollie AR, Beddome M, Collen KK & Paluch RA (2001) Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. *Obes Res* **9**, 171–178.

Epstein LH, Myers MD, Raynor HA & Saelens BE (1998) Treatment of pediatric obesity. *Pediatrics* **101**, 554–570.

Epstein LH, Valoski AM, Vara LS, McCurley J, Wisniewski L, Kalarchian MA, Klein KR & Shrager LR (1995) The effects of decreasing sedentary behaviour and increasing activity on weight change in obese children. *Health Psychol* **14**, 109–115.

Epstein LH, Valoski AM & Wing RR (1990) Ten year follow-up of behavioral, family-based treatment for obese children. *JAMA* **264**, 2519–2523.

Epstein LH, Wing RR, Koeske R, Andrasik F & Ossip DJ (1981) Child and parent weight loss in family-based behavior modification programs. *J Consult Clin Psychol* **49**, 674–685.

Epstein LH, Wing RR, Steranchak L, Dickson B & Michelson J (1980) Comparison of family based behavior modification and nutrition education for childhood obesity. *J Pediatr Psychol* **5**, 25–36.

Glenny AM, O'Meara S, Melville A, Sheldon TA & Wilson C (1997) The treatment and prevention of obesity: a systemic review of the literature. *Int J Obes* **21**, 715–737.

Golan M, Fainaru M & Weizman A (1998*a*) Role of behavior modification in the treatment of childhood obesity with the parents as the exclusive agents of change. *Int J Obes* **22**, 1–8.

Golan M, Weizman A, Apter A & Fainaru M (1998*b*) Reliability and validity of the family eating and activity habits questionnaire. *Eur J Clin Nutr* **52**, 771–777.

Golan M, Weizman A, Apter A & Fainaru M (1998*c*) Parents as the exclusive agents of change in the treatment of childhood obesity. *Am J Clin Nutr* **67**, 1130–1138.

Golan M, Fainaru M & Weizman A (2001) Familial approach to the treatment of childhood obesity: a conceptual model. *J Nutr Educ* **33**, 102–106.

Hill JO & Peters JC (1998) Environmental contributions to the obesity epidemic. *Science* **280**, 1371–1374.

Israel AC, Guile CA, Baker JE & Silverman WK (1994) An evaluation of enhanced self-regulation training in the treatment of childhood obesity. *J Pediatr Psychol* **19**, 737–749.

Israel AC, Stolmaker L & Andrian CA (1985) The effects of training parents in general child management skills on a behavioral weight loss program for children. *Behav Ther* **16**, 169–180.

Johnson SL & Birch LL (1994) Parents' and children's adiposity and eating style. *Pediatrics* **94**, 653–661.

Lerner S & Lerner HR (1983) A systemic approach to the resistance – theoretical and technical consideration. *Am J Psychother* **37**, 339–387.

Mendonca PJ & Brehm SS (1983) Effects of choice on behavioral treatment of overweight children. *J Soc Clin Psychol* **1**, 343–353.

Muller MJ, Asbeck I, Mast M, Langnase K & Grund A (2001) Prevention of obesity – more than intention. Concept and first results of the Kiel Obesity Prevention Study (KOPS). *Int J Obes.* **25,** Suppl. 1, S66–S74.

Patton GC, Johnson-Sabine E, Wood K, Mann AH & Wakeling A (1990) Abnormal eating attitudes in London school girls – a prospective epidemiologic study: outcome at twelve month follow-up. *Psychol Med* **20**, 383–394.

Satter EM (1988) Should the obese child diet? In *Evaluation and Management of Eating Disorders*, pp. 61–75 [KL Clark, RB Parr and WP Castelli, editors]. Champaign, IL: Life Enhancement Publications.

Satter EM (1996) Internal regulation and the evolution of normal growth as the basis for prevention of obesity in children. *J Am Diet Assoc* **96**, 860–886.

Summerbell CD, Ashton V, Campbell KJ, Edmunds L, Kelly S & Waters E (2003) Interventions for treating obesity in children. *Cochrane Database Sys Rev* **3**, CD001872.

Thompson JK, Coovert MD, Richards KJ, Johnson S & Cattarin J (1995) Development of body image, eating disturbance, and general psychological functioning in female adolescents: covariance structural modeling and longitudinal investigations. *Int J Eat Disord* **18**, 221–236.

World Health Organization (1998) *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity*. Geneva, 3–5 June 1997. Geneva: WHO.