

# Family involvement in the treatment of childhood obesity: the Copenhagen approach

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## Abstract

**Introduction** The objective of this study was to assess the impacts of a family-based childhood obesity treatment on anthropometry and predictors of dropout and successful weight loss.

**Materials and methods** The 18-month treatment consisted of a intensive period (IP) including physical exercise, nutritional guidance, family psychotherapy, child group sessions and a 1-year follow-up (FU).

**Results** One hundred children (10–12 years old, >140% of median weight-for-height) participated. The 81 children completing the IP decreased significantly from 2.9 to 2.6 body mass index (BMI) standard deviation score (SDS) units ( $p < 0.001$ ). Furthermore, mean body fat percentage decreased significantly from 33.7 to 31.9 during IP. The 49 children completing the FU had a further decrease of 0.2 BMI SDS units ( $p = 0.003$ ). Weight loss was less in children from immigrant families. Drop-out was higher if the mother had limited education and in immigrant families.

**Conclusions** This treatment with a psychological approach is feasible and results in significant weight loss during the programme. Future research should focus on how to improve the results of families with limited education and immigrants with non-European origin.

**Keywords** Childhood obesity · Family-based interventions · Outpatient · Sociodemographic predictors

## Introduction

The development of obesity in Denmark follows the pattern seen in the rest of the industrialised world. In particular, childhood obesity is rapidly increasing. Over the past 50 years, the prevalence among children between 6 and 8 years of age increased from 0.04% to 5% in boys and from 0.2% to 4% in girls [33]. This unfavourable trend requires actions that address general prevention and that develop and evaluate community-based methods of treatment.

Treating childhood obesity is difficult. The recent Cochrane review on treatment stated that there continue to be few studies from which conclusions concerning effective treatment methods could be drawn and that these reports featured limited interventions [32, 40]. Most authors agree that treatment of childhood obesity should be family-based, includes a psychological intervention aimed at changing lifestyles and should use methods to motivate families to join and stay in the treatment programme [1, 8, 11, 13, 15, 23, 25, 32]. However, the published treatment programmes have differed considerably with respect to levels of intensity and duration of the intervention, extent of parental involvement, and the degree to which nutrition and physical training are incorporated. The focus of treatment has shifted from solely dietary restriction to the introduction of healthy habits and motivation for change [16, 32]. Flodmark et al. [12] argued that treatment of childhood obesity must function in a multidisciplinary setting, and has to take into account both the physiological and psychological maturation of the growing child. It has also been shown that the effects of interventions in pre-adolescent children are more

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persistent than in adults [23] and that a group approach is more effective and sustainable for longer than individual therapy [2, 17]. Obesity is more prevalent in families of low socioeconomic status, and it is necessary to accept that treating children and families with obesity involves dealing with people who are often influenced by many circumstances and problems that make such treatment difficult [21, 39]. Furthermore, the association between socioeconomic status and obesity is not well defined because it is unclear which specific factors affect childhood obesity [37]. The educational level of the parents is an important element, but we do not know whether this arises as a consequence of a person possessing the skills needed to get an education or not, the education itself or cognitive stimulation in the home environment [39]. The Cochrane review still questions what the family characteristics are and which promote success in the treatment of child obesity [32]. Predictors have to be identified and understood. Zeller et al. [44] emphasised the important role that the psychological distress of families can have on handling lifestyle habits, and it has been suggested that targeting this distress might improve treatment outcomes [44]. This implies the need for a diverse treatment that takes the psychosocial aspect of being obese into account. Thus, the goals and techniques used must be appropriate for a variety of socioeconomic groups [10, 36, 42]. It may still be difficult to keep families in the programme, and some authors describe poor compliance and a large number of “drop-outs” as the major cause of failure in treatment of obesity [7, 22].

This paper presents the results from the Copenhagen approach to treatment of childhood obesity in which the pivotal element is a psychological intervention in family motivation and health behaviour. The study also investigates the duration of engagement and attendance in relation to socioeconomic stratification and seeks to detect potential socioeconomic predictors of successful treatment.

## Materials and methods

### Subjects

The participants were families with children aged 10 to 12 years, weighing more than 40% above the median Danish weight-for-height reference and living in a specific area of Copenhagen (northwest). The families were consecutively included in the prospective trial. A weight-for-height value 40% above the median of the reference corresponds to a body mass index (BMI) close to the 99th centile for 10- to 12-year-old children. School-visiting nurses, family practitioners or schoolteachers referred children and families to the treatment. The children were

included if the parents were willing to participate actively, could manage to transport the child and agreed to comply with the programme for 18 months. The treatment was free of charge for the families. The child should not have major psychological and developmental problems. At least one of the parents had to speak Danish.

### The intervention

In November 2001, a 3-year project for treatment of childhood obesity was introduced in Copenhagen. At that time, no comprehensive treatment programmes for obesity were available in the city. The overall aim of this project was to develop an effective and affordable community programme based on an interdisciplinary collaboration whose pivotal element was a family psychological intervention (individual family and in-group sessions) and which involved the action areas of physical activity and nutrition.

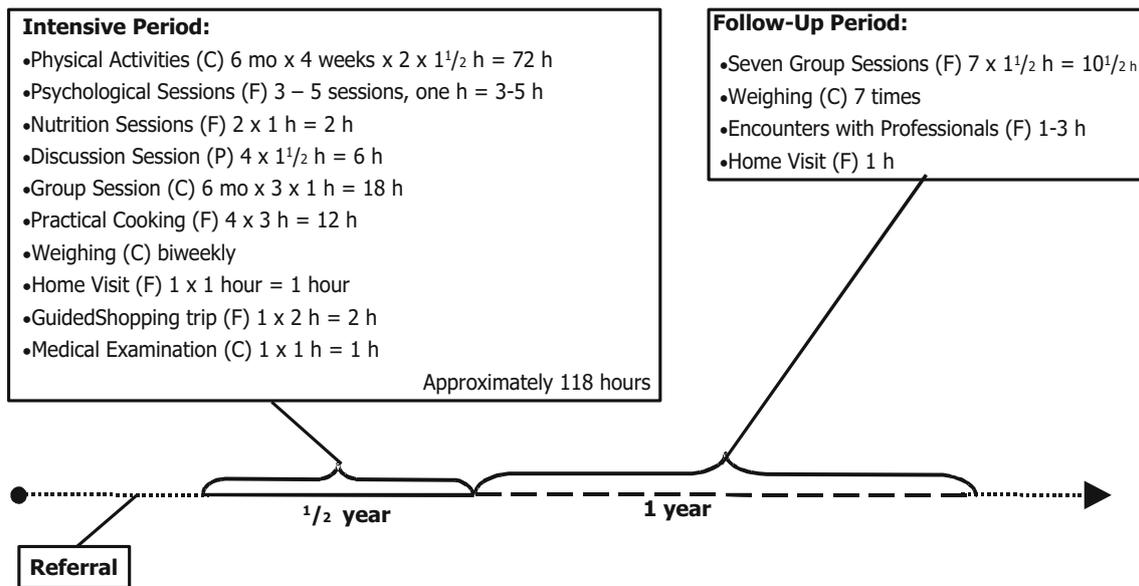
The main aim of the intervention was to encourage children’s weight loss and weight maintenance through increased family competence in developing healthy lifestyle habits. We also hoped to improve the children’s wellbeing and self-confidence, but these aspects were not measured.

The treatment programme consisted of an 18-month intervention with a 6-month intensive phase and a less intensive, 1-year follow-up that took place at a local community centre (Fig. 1). In developing the programme, we were inspired by the ideas and theories presented in the papers by Epstein [9–11], Flodmark [13] and Braet [2].

The physical exercise, run by supervised coaches trained at the Department of Exercise and Sport Sciences, University of Copenhagen, consisted of games especially adapted to the physique, motor skills and social needs of the group. This activity programme aimed to increase the pleasure in movement and to strengthen social competences in the groups. Activity and skill levels were increased during the intensive period (IP), and guest trainers introduced other sports during this phase. The families received guidance on sports, reducing sedentary activities and everyday physical exercise in line with the current official recommendation of the National Board of Health for 1 h of physical activity daily [28].

The nutrition sessions, run by a certified clinical nutritionist, focused on healthy food choices and regulation of portion size rather than calorie restriction. The families kept 4-day food records, which were used to discuss healthy and realistic changes in food habits. Emphasis was placed on reducing the intake of fast food, drinks containing sugar and sweets, and on increasing the intake of vegetables, fruit and whole-grain bread.

The children also attended group sessions with the nutritionist where the themes were healthy nutrition and how to develop the ability to handle lifestyle changes.



**Fig. 1** Outline of the contents of the two treatment phases. *C* child, *F* family, *P* parents

All families attended practical cooking sessions with a chef and a nutritionist, and participated in a guided shopping trip to a local supermarket. The parents participated in discussions on topics related to the challenges families face when changing lifestyle habits.

The follow-up phase consisted of group meetings with all families. These meetings focused on the families' development of healthy life styles and the well-being and weight development of the children. Individual family sessions took place upon request.

The psychological intervention, run by an authorised psychologist, took place in individual family psychological sessions, child group psychotherapy and discussion sessions with parents and in supervision of the staff. Each month, an interdisciplinary conference, chaired by the psychologist, was dealing with themes of the therapeutic development of the families.

Families with an obese child have different resources, problems and motivation. In addition, the problems associated with obesity and the process of changing lifestyle occur at several psychological levels, e.g. behavioural, cognitive, reflective, relational and emotional [20]. Dealing with these different levels of demand a combination of methods in the psychological intervention, which was used to achieve the greatest effect. Therefore, a mixture of cognitive, behavioural and psychodynamic interventions was employed. The cognitive interventions were used in psycho-education and family contracts and behavioural interventions in a point and gratification system. In the individual family psychological sessions (three to five times for each family) and in child group psychotherapy, a

psychodynamic approach to understanding resistance, relations and motivation [35] in the family was taken, set within a system theoretical framework [4, 14]. The children attended group psychological sessions that addressed themes such as being an overweight child and bullying, and these sessions took the children's emotional, cognitive and social maturity as a starting point. The group sessions included specific exercises in managing teasing, increasing self esteem, reflecting on motives, social skills and problem-solving.

The methods and actions in the interventions were differentiated in proportion to the resources, psychodynamic structure and motivation of each family. This aspect of the intervention is published elsewhere [20].

The intervention was continuously supervised, evaluated and developed, with particular focus on the degree of family involvement, the concept of follow-up and the pedagogic approaches in the group sessions with the children and the parents.

#### Weight and body composition measures

Anthropometric measurements were taken every 2 weeks during the IP and seven times during the follow-up (FU). Weight was measured to the nearest 100 g on an electronic scale (Tanita, Tanita Corporation, Japan) while the individual was dressed in light underwear, without shoes. Height was measured on a Seca stadiometer (Seca gmbh & Co., Germany) to the nearest millimetre. Percentage body fat was measured on a Tanita 300 body impedance instrument (Tanita Body Composition Analyzer, Tanita Corporation, Japan).

## Statistical analysis

To analyse the change in weight over the treatment period, body mass index ( $\text{kg}/\text{m}^2$ ) was calculated. On account of the physiological increase in BMI with age, the BMI was adjusted for age and sex using standard deviation scores (BMI  $Z$  scores). Calculation of  $Z$  scores was based on national reference data for Danish children [31]. The non-parametric Mann–Whitney test was used to establish whether the child's and family's dropout rate differed according to the family's attendance in project activities.

The presence of children and parents at each session was recorded to calculate the percentage of the sessions they attended. The chi-square ( $\chi^2$ ) test was used to establish differences in proportions of various characteristics between dropouts and completers. The paired  $t$  test was used to investigate whether mean changes in BMI  $Z$  scores and fat percentage in the treatment periods were statistically significant.

Univariate analysis of variance (ANOVA) was used to identify associations between mean changes in BMI  $Z$  score and socioeconomic indicators. The level of significance was set at 5%, while results with  $p$  values between 0.05 and 0.1 were considered to reflect tendencies. All statistical analyses were performed using SPSS (v. 13.0, SPSS Inc., Chicago, IL, USA).

A chi-square test was used (Statistix 7.0) to compare the level of parental education and divorce rates in our participants to those in larger samples.

To analyse associations with the ethnicity or origin of families, they were divided into two groups, those where one or more parent and grandparents were born and raised in Denmark, Northern or Western Europe (referred to as the group with Danish or European origin) and those with origin from countries outside Europe (mainly Africa and the Middle East (referred to as immigrants with non-European origin).

## Results

The 100 children and their families who fulfilled the inclusion criteria were divided into seven treatment groups, each of which followed the same sessions (Table 1). The parents had a lower education than the average education. Overall, one fifth (19.0% of women and 21.2% of men) of this demographic stratum have spent less than 10 years in education, while in this study, one third of the parents (33.7% for women,  $p=0.0026$ , and 32.2% for men,  $p=0.0013$ ) had done so [38].

The children in this study were significantly more likely ( $p<0.001$ ) to have experienced divorce of their parents or never to have lived with both parents (50% of children)

**Table 1** Basic characteristics of children and their families at the start of the programme

Demographic parameters	Number	Values
Age (years) <sup>a</sup>	100	10.9 (0.7)
Sex (female/male)	100	56/44
Weight (kg)	100	60.6 (10.7)
Height (m)	100	149.8 (7.4)
Child BMI (start) <sup>a</sup>	100	26.9 (3.3)
Child BMI- $Z$ scores (start) <sup>a</sup>	100	3.0 (0.5)
Child body fat percentage (start) <sup>a</sup>	100	34.0 (6.6)
Mothers with <10 years education (%)	98	33.7
Fathers with <10 years education (%)	90	32.2
Mothers who are unemployed (%)	100	39.0
Fathers who are unemployed (%)	91	23.1
Children who experienced divorce or have never lived with both parents (%)	100	50
Children with one or both parents describing themselves as overweight (%)	98	79.6
Mothers who have tried to lose weight (%)	96	59.4
Fathers who have tried to lose weight (%)	96	21.9
Children with no siblings (%)	100	17
Children who were not born in Denmark (%)	100	5
Children, one or both of whose parents' country of origin was not Denmark (%)	100	34
Family ownership of residence (%)	95	42.7

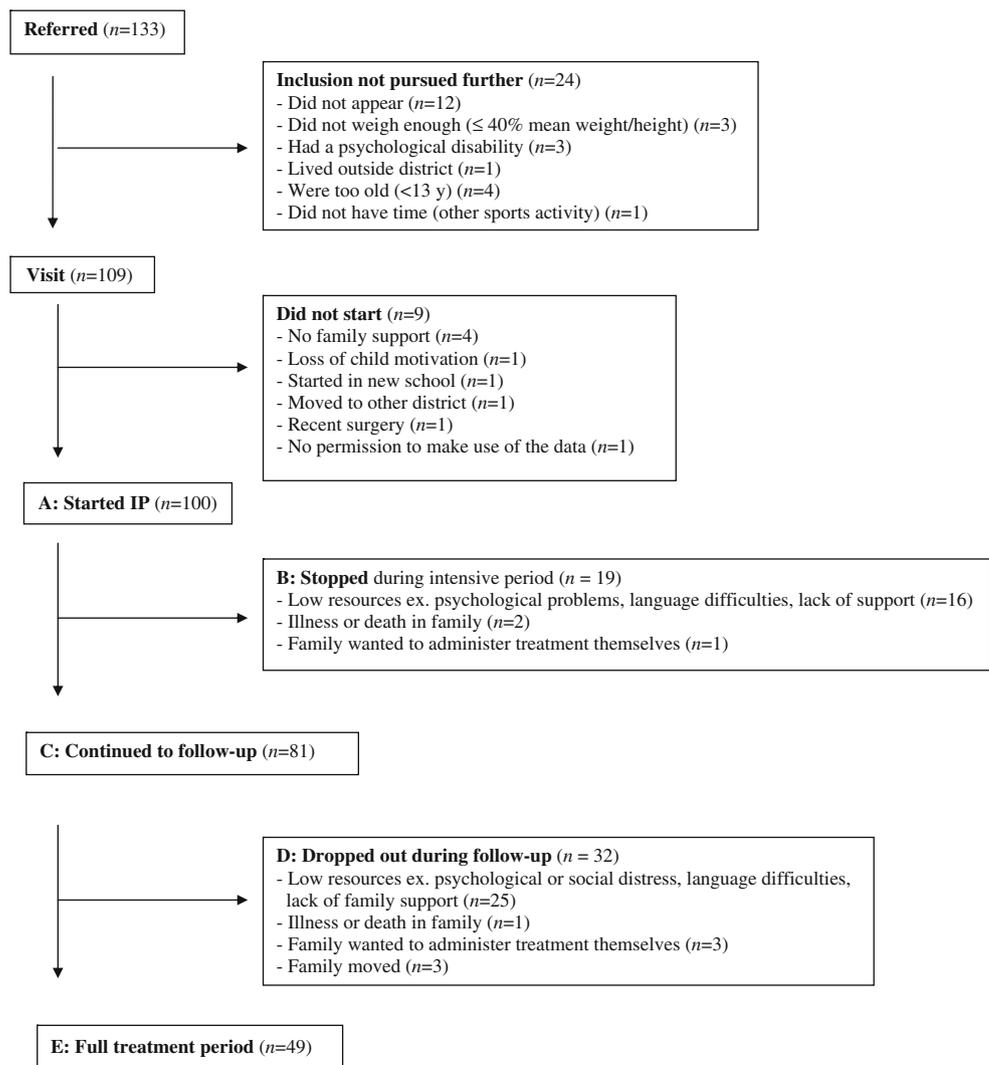
<sup>a</sup> Mean $\pm$ SD

than were a large random sample of 5,000 11- to 15-year-old Danish children (32%) [43].

At the beginning of the programme, the mean age of the 100 children was 10.9 years (range, 9.5–12.7 years). Six children below the age criteria (9.5–9.9 years) were included. They were all younger than their peers when starting school and were included in the treatment after a preadmission assessment done by the psychologist because they matched the main group of children in physical and psychological maturity. There were fewer boys (44%) than girls (56%). The mean BMI at inclusion was 26.9 (range, 21.0–34.8), and the mean BMI  $Z$  score was 3.0 (range, 1.7–4.4).

The numbers of children recruited for the study, not participating, dropping out and completing the intensive period and the follow-up period are shown in Fig. 2, with the reasons for not participating or dropping out, where relevant. Figure 2 illustrates five groups of specific interest. Group A includes all the families that began the treatment; group B includes those who dropped out in the

**Fig. 2** Flowchart with participants. The *groups A to E* are referred to in the text and tables



intensive phase. Group C includes the families that completed the intensive phase, and group D are the families who dropped out during follow-up. Finally, group E includes the families that completed the whole treatment period.

#### Attendance

Child and family attendance during the IP were both significantly lower among those who subsequently dropped out of the programme at any stage (Table 2). Of those who dropped out during FU, only the parents, but not the children, had a significantly lower attendance during the IP.

#### Relationship between socioeconomic conditions and duration of participation

Table 3 compares the characteristics of the families completing the programme with those who dropped out. Significantly more unemployed mothers dropped out ( $p >$

0.001), and considerably more mothers with limited school attendance dropped out ( $p=0.0019$ ). Educational level and employment status of the father did not appear to influence the likelihood of a family completing the programme. There was a significant difference in the parents' weight between the families who dropped out and the families who completed the programme ( $p=0.045$ ). Among those who dropped out, 87.8% had one or two overweight parents, while this figure was only 71.4% among those who completed. Significantly more immigrant parents with non-European background did not complete the treatment programme ( $p=0.049$ ). There were no effects arising from whether or not the child had siblings, had been teased or if the family owned their residence. Neither age, gender nor BMI differences at inclusion were significantly associated with attendance at the treatment programme.

The mean change in BMI during the first month of intervention was not a significant indicator of dropping out ( $p=0.387$ ).

**Table 2** Child and family attendance during the intensive period until the child withdrew from the programme

Group	Mean duration of treatment in months (range)	Median child attendance during the IP (% of activities)	Median family attendance during the IP (% of activities)
A. Started ( <i>n</i> =100)	–	77	75
B. Stopped during IP ( <i>n</i> =19)	2.0 (0.3–3.7)	42 ( <i>p</i> <0.001) <sup>a</sup>	50 ( <i>p</i> <0.001) <sup>a</sup>
C. Completed IP ( <i>n</i> =81)	–	81	78
D. Stopped during FU ( <i>n</i> =32)	7.1 (4.1–12.2)	78 ( <i>p</i> =0.031) <sup>b</sup>	60 ( <i>p</i> <0.001) <sup>b</sup>
E. Completed IP and FU ( <i>n</i> =49)	–	86	89

Neither age, gender nor BMI differences at inclusion were significantly associated with compliance or the likelihood of staying in the programme.

<sup>a</sup> The non-parametric Mann–Whitney test-results compared to C

<sup>b</sup> The non-parametric Mann–Whitney test-results compared to E.

### Change in BMI Z scores and body fat percentage

The changes in BMI Z scores during the intervention are shown in Fig. 3. The changes in those who completed the full programme were compared to those in the two groups who dropped out either during the IP or FU. Those who completed the full intervention had a significant decrease in BMI Z score, from 2.9 at the start to 2.6 at the end of the IP (*p*<0.001). There was a further significant decrease during the follow-up period from 2.6 to 2.4 (*p*=0.003). The starting values among those who completed and those who dropped out were not different (3.1 vs. 2.9, *p*=0.29). The decrease during IP among those who dropped out during the FU was less, from 3.1 to 2.9, but was still significant (*p*<0.001). There was no further decrease from 2.9 during the first months of FU and the point at which they dropped out.

The changes in body fat percentage in the three groups are shown in Fig. 4. Among those who completed the programme, there was a significant average decrease in fat percentage from 32.2 to 30.1 (*p*=0.002) during the IP. During FU, this value decreased further to 29.5, although this change was not significant (*p*=0.567). Taken together, from the beginning to the end of the treatment, the mean

body fat percentage of those who completed decreased from 32.2 to 29.5 (*p*=0.008). There was a tendency for the initial BMI Z scores to be higher among those who dropped out. There was no significant change in fat percentage in these groups during the period they followed the treatment (data not shown).

On account of the large within-group variation, individual results for changed BMI Z scores are presented for those who completed the IP (Fig. 5) and for those who also completed the FU (Fig. 6). During the IP, the BMI Z score decreased in 81.5% of the children (*n*=81; Fig. 5), while 81.6% of those who completed the full treatment programme (*n*=49) achieved a decrease in BMI Z score (Fig. 6).

Based on an intention-to-treat analysis, 68% of the 100 children experienced a reduction in BMI standard deviation score (SDS) during the IP, and 41% of them showed reduced or unchanged BMI SDS during the complete treatment.

### Predictors of change in BMI Z scores

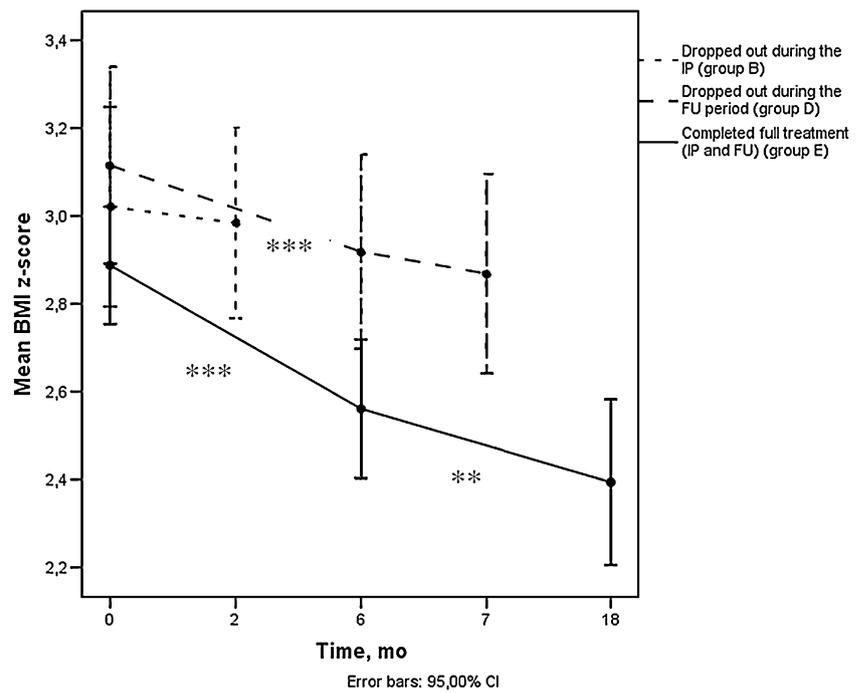
Predictors of reduced BMI Z scores in the IP were investigated using ANOVA (Table 4). The only factor found to be significant was the ethnicity of the parents,

**Table 3** Characteristics of families that participated in the complete programme compared to those of families that dropped out

Socioeconomic indicator	Completed IP and FU (Group E) <i>n</i> =49	Stopped during IP or FU (Groups B or D) <i>n</i> =51	<i>p</i> <sup>a</sup>
Percentage of mothers with <10 years school attendance	22.4	44.9	0.019
Percentage of mothers who are unemployed	20.4	56.9	<0.001
Percentage of mothers who describe themselves as overweight	51.0	69.4	0.063
Percentage of children with one or both parents describing themselves as overweight	71.4	87.8	0.045
Percentage of children with immigrant parent with non-European origin	25.5	43.1	0.049

<sup>a</sup>  $\chi^2$  test. Only characteristics with a *p*<0.1 are included in the table. The other socioeconomic characteristics with no significant association were: fathers' school attendance, fathers' employment status, whether the child had been bullied or had siblings, and ownership of residence. Neither age, gender nor BMI differences at inclusion were significant in relation to the efficiency of the treatment

**Fig. 3** BMI Z scores according to duration of treatment for the groups that completed the full treatment (*bold line*), that dropped out during the intensive period (*short dashes*) and that dropped out during follow-up (*long dashes*). Ninety-five percent confidence intervals are shown. Significance of *t* test results of paired-sample comparisons: \*\* $p < 0.01$ , \*\*\* $p < 0.001$

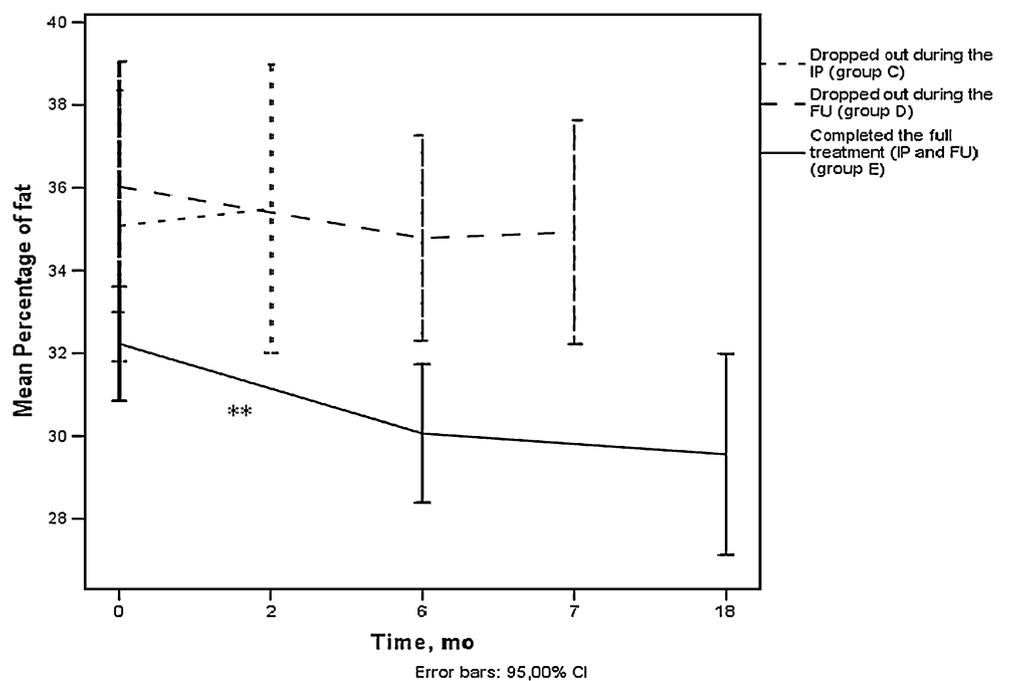


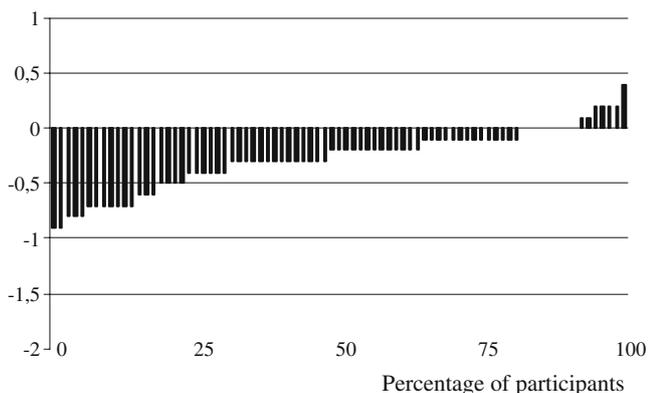
whereby weight loss in children of immigrants with non-European origin was approximately half that observed in families of Danish or European origin. Three of the other factors were close to significance. Weight loss tended to be less if the father had a limited education or if the child had no siblings and, surprisingly, if the family owned, rather than rented, their residence.

**Discussion**

In this multidisciplinary family-based treatment programme for 10- to 12-year-old obese children, 81% of the families completed the intensive 6-month period, and 49% completed the full 18-month treatment. More than 80% of those who completed the full treatment lost weight, and about

**Fig. 4** Percentage body fat according to duration of treatment for the groups that completed the full treatment (*bold line*), that dropped out during the intensive phase (*short dashes*) and that dropped out during follow-up (*long dashes*). Ninety-five percent confidence intervals are shown. Significance of *t* test results of paired-sample comparisons: \*\* $p = 0.002$

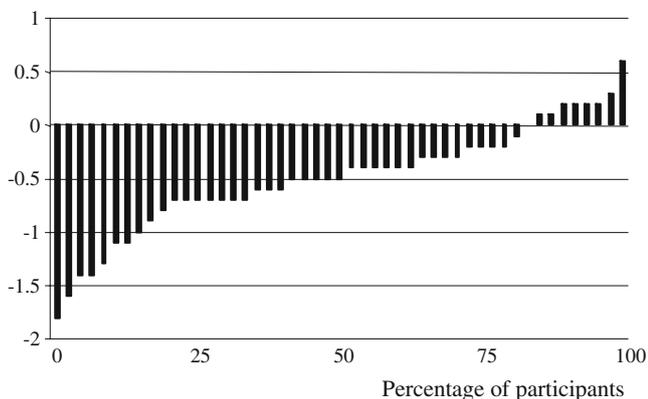




**Fig. 5** Changes in BMI Z scores during IP, 6 months. Each bar represents one child ( $n=81$ )

half of these lost 0.5 BMI SDS or more. These results are comparable to or better than those achieved by most other treatment programmes with published results.

The mean BMI Z score decreased by an average of 0.5 units for those who completed the full 18-month intervention. Almost half of the decrease in BMI Z score was achieved during the 12-month follow-up, when there were only seven sessions for the families, indicating that the changes in the families' lifestyles implemented during the intensive phase continued to be effective. In a comparable larger study lasting for 8 months, the German Freiburg Intervention Trial for Obese Children (FITOC) programme found a somewhat smaller decrease of 0.2 BMI SDS [25], and in a study from Australia, children ( $n=91$ ) attending a family-focused weight-management programme with parenting-skills training decreased 0.24 in BMI SDS over 12 months [18]. A new study from Italy is interesting because the follow-up period was 3 years. Children ( $n=85$ ) and their parents followed a Therapeutic Education Program resulting in a significant 0.44 decrease in BMI SDS over the 3-year period [41]. However, the change we found was not as large as that of a small study from the USA with



**Fig. 6** Changes in BMI Z scores during the complete programme, 18 months. Each bar represents one child ( $n=49$ )

**Table 4** Socioeconomic predictors of change in BMI Z scores during IP

	Mean change in BMI Z score (95% CI)	<i>p</i>
Fathers' educational attendance		
>10 years ( $n=52$ )	-0.313 (-0.391; -0.236)	0.063
≤10 years ( $n=24$ )	-0.183 (-0.297; -0.070)	
Number of siblings		
At least one ( $n=65$ )	-0.303 (-0.371; -0.235)	0.072
None ( $n=16$ )	-0.163 (-0.300; -0.025)	
Ownership of residence		
Ownership ( $n=37$ )	-0.216 (-0.307; -0.126)	0.082
Rental ( $n=44$ )	-0.325 (-0.403; -0.238)	
Ethnicity of parents		
Both Danish or European background ( $n=53$ )	-0.323 (-0.398; -0.248)	0.036
One or both immigrants with non-European origin ( $n=28$ )	-0.186 (-0.289; -0.083)	

Univariate analysis of variance. Only predictors with  $p<0.1$  are presented. Socioeconomic variables that were not significant were: mothers' education and employment status, whether parents perceived themselves to be overweight, whether the children had experienced divorce or parents never living together, and whether the child had been teased or not.

severely obese children lasting for 3 months. They achieved a mean decrease of 1.7 BMI units [26].

In addition to the weight loss, the children in our study had a significant decrease in body fat (from 32.2% to 30.1%) during the intensive 6-month period, most probably because our treatment programme involved 2-weekly sessions with physical activity that was likely to increase muscle mass. With an average body weight of 60.6 kg at the start of the treatment, this change equals a decrease in fat mass of about 1.3 kg, even if there had been no weight loss. Interestingly, the body fat percentage did not increase during the 12-month follow-up, despite there being no sessions with physical activity during this period.

The treatment programme focused on the family and required a strong commitment on their part. Their active participation was therefore essential to the success of the treatment. About 80% of the families enrolled in this study completed the intensive treatment period, which is higher than in other childhood treatment programmes [6, 24]. However, our drop-out rate increased during follow-up, whereby 39.5% of those who began follow-up gave up before the end of the period.

Weight loss during the intensive period was not a predictor of adherence during FU. In fact, 90.6% of the children in the group of families that dropped out during the FU recorded a decreased or unchanged BMI Z score during the IP. This is consistent with other clinical studies, which showed that initial weight loss had no substantial impact on

the families' continued adherence to the treatment [6, 8]. This seems to bear out the proposal of Miller and Rollnick that "it is possible (...) that both treatment adherence and positive outcomes are related to some third factor—like motivation for change" [27]. We are yet to measure or fully comprehend the nature of the relationship between motivation and successful weight loss.

The parents in the group that dropped out in the FU participated considerably less during the initial IP than those who completed the full programme (60% vs. 89%). This underlines the crucial importance of engaging the parents [15, 16] and of trying to develop methods to motivate and retain in the programme those parents whose poor adherence suggests that they are likely to drop out. An analysis of the families' motivation for treatment will be published elsewhere.

The only significant predictor of weight loss was the ethnicity of the parents. Weight loss was considerably less if one or both parents were immigrants of non-European origin. This group also had a higher risk of dropping out, which has also been described in other studies [26]. Communication with and involvement of some of these families was difficult because of cultural differences and language problems. Few researchers have considered the special concerns of different cultural norms and habits, which are naturally connected to eating and physical activity [3]. It remains a challenge to develop methods and strategies to make the treatment more effective for families with a non-European cultural background.

The educational level of parents is well known to be a predictor of obesity risk, and we are not surprised that there was a tendency for parental educational level to predict weight loss and drop-out. As mentioned, families with low socioeconomic status are often influenced by a number of circumstances and problems that hinder treatment, especially those based on their motivation and active engagement.

Overweight among the parents was a risk factor for dropping out that could arise from their lower self-efficacy [5]. Another study has shown that children from families with normal-weight parents more easily lost weight [9]. This indicates that, in future treatment programmes, it would be useful to include the parents' current and past weight status, discussing their experiences if they were overweight.

The main aim of the treatment was to achieve weight loss in the children, and there was no formal registration of psychosocial effects. Other studies have reported positive psychosocial effects on the children's mood and eating disorders, enhanced self-esteem, decreased levels of depression and adoption of a more active lifestyle [8, 25, 26]. An external evaluation of the present project found that the children who received the treatment showed an increased desire for physical activity, greater self-confidence and experienced better moods and less bullying by other

children. The evaluation included qualitative interviews carried out with children, parents and staff members [29].

The study is limited by the absence of a control group. It proved difficult to include a comparable control group for an 18-month intervention in which families were interviewed about their motivation and had to sign an agreement of collaboration. As noted in similar studies by Reinehr et al. [34], it is problematic to select a control group with the same characteristics as the studied group due to the high drop-out rate (around 50% in this case). Furthermore, those families who decided to participate in the study would most likely have a motivation which was very different from those in a control group. For these reasons, several studies presenting the effect of childhood obesity treatments have not included a control group [8, 26, 35]. If we compare the results of our intervention with the control groups from comparable studies, the tendency is that the BMI SDS of the control group is not decreasing. In the FITOC study, there was no change in the BMI SDS of the control group over an 8-month period, and in the study by Nowicka et al. [30], BMI SDS increased from 3.21 to 3.30 over a 1-year period. Other researchers had pointed out that with the current situation with a high demand of obesity treatment programmes, we are requested to compare the "raw" outcome and then use the limited information to stimulate the development of new treatments [6].

With treatment based on a project with a psychotherapeutic component and interaction between families and professionals as crucial actions, we recognise that there could have been a "therapist effect". A further limitation is that this study only included 10- to 12-year-old children, so the results cannot be extrapolated directly to other age groups. Furthermore, even though they did lose weight, the children did not end up at the normal weight for their height after completion of the treatment.

The programme can be further improved and adjusted to obtain better results. A priority is to improve the handling of families with limited education, e.g. by using concrete and short-term perspectives when working with motivational questions, and to better understand cultural aspects in immigrant families from non-European cultural backgrounds, which will also include the use of interpreters. The psychological approach supports the families' process of change by raising their consciousness about their motives and emotions for changing their lifestyle habits. Obviously, we are not able to change the socioeconomic background and conditions of the target group, so instead we need to adapt the programme to suit them better.

Our experience with the project has been documented in detail in a book written by the team behind the treatment. This is accompanied by a CD-ROM with all the plans and forms used in the project [19]. This publication is aimed at other groups who are considering setting up a similar project.

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