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Prevention of further weight gain in overweight school children, a pilot study

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Background: Involving school nurses in weight gain prevention activities in already overweight children may be a means to address childhood obesity prevention.
Objective: To describe and evaluate a treatment method aimed for implementation in school care centres.
Methods: Twenty families (20 overweight children aged 7 years) were interviewed at baseline with standardized questionnaires, received simple dietary and lifestyle advice. Weight was measured and advice/support by school nurses was available monthly during the 1-year period. A follow-up was made after 1 year. Changes in wellbeing, life style and body mass index (BMI) *z*-score were recorded and analysed. Experiences from parents and nurses were also examined.
Results: A good (91%) or fair (54%) adherence to dietary advice was found in children who decreased or maintained their *z*-score respectively. Mean BMI *z*-score reduced [−0.16 ($p = 0.03$)] during the intervention period. Generally, parents and school nurses were satisfied with the programme, helping them to set limits and be more self-confident in their role as 'health adviser' respectively.
Conclusions: Overweight progression in younger children is possible to modify by increased awareness of the problem, of their food habits and lifestyle practices. Providing school nurses with the knowledge to address the problem and working in collaboration with dieticians and a healthcare team can be an effective means to prevent further weight gain in overweight school-age children. Possibility of stigmatization was expressed thus efforts will need to be made to carry out such a programme to preserve the children's integrity and run activities in a discrete manner in the school environment.

Keywords: child, intervention programme, life style, nurses, overweight, parents, school.

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Introduction

Being overweight is one of the largest health-related problems affecting all ages in western society today. In Swedish children aged 4–12 years, the prevalence of overweight according to International Obesity Taskforce reference for children (1) is 17–23% (2). If no actions are taken, the prevalence is expected to increase. Many reports and conferences about childhood obesity in recent years have concluded that efforts must be made to prevent children from becoming overweight and that there is a need for more research in this age group (3, 4). According to SBU (5) [The Swedish Council on Technology Assessment in Health Care], there is a great need for knowledge about effective treatment aimed at weight reduction and maintenance thereof, and it is important to develop and assess long-term methods for prevention and treatment of obesity in children and adolescents.

Involving school nurses in the work with overweight children may be a method with great potential and good cost efficiency (6, 7). Health professionals in schools today are working to combat childhood obesity; however, barriers, such as lack of support from principals (school boards), parental involvement, lack of patient motivation and lack of support services interfere with these efforts. School care centres (SCC) need easily implemented programmes to address childhood obesity prevention (7, 8).

The aim of this study is to test a treatment model to prevent further weight gain in overweight children and record experiences of parents of treated children and those of the caring nurses.

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Methods

Subjects

In 2001, a screening of weight and height was performed in 32 schools in Halmstad County, Sweden, among 7-year-old children, n = 1043. Using the Swedish SCC standards for body mass index (BMI) curves (9, 10), 66 (6.3%) were overweight (iso BMI 25) and 39 (3.7%) of the children were determined to be obese (iso BMI 30). All the families of children with overweight were sent an invitation letter from the project coordinator outlining the SCC-based programme which would include initial advice by a dietician and follow-up by the school nurse during a 1-year period.

In all, 35 families took part in initial information meetings. The dietician presented background information on how childhood obesity starts and the consequences of childhood obesity for later life if not intervened. The planned 1-year intervention programme for addressing overweight in school was presented to the families. A registration form was handed out to the parents to confirm their participation in the project.

Twenty families registered to take part in the project in 2002, comprising 20 children from 13 primary schools. Later, 19 untreated overweight school-mates of the subjects were selected among children declining to take part in the project by the school nurses at the 13 cooperating schools and were considered as a 'reference group' for growth.

Training of nurses by the obesity team

In total, 15 nurses attended a short course, held by the obesity team of Halmstad County Hospital. The physician presented the medical risks of obesity (90 minutes). The physiotherapist lectured (30 minutes) on children's need of physical activity and exemplified with some feasible activities to reduce sedentary lifestyle and presented an activity questionnaire. The dietician instructed (90 minutes) how to make a dietary anamnesis and emphasized that few and simple dietary advice should be given. The psychologist and dietician together had group sessions with the nurses, the aim being to allow for discussion of how to create a good meeting environment with children and families, frequency of meetings and the feasibility of prevention activities in school (30 minutes). The results of the group sessions did influence the final format of the treatment plan.

The nurses were instructed on: how to deal with the weight controls at school; ideas and tips regarding diet and physical activity. A letter of information which the nurses could copy and hand out to the families was provided.

Study procedure

At the baseline visit, the nurse and dietician worked in collaboration, both being present throughout the meeting with child and parent. Weight (kg) and height (cm) of the child were measured without shoes but with lightweight clothing by the same school nurse; BMI was calculated and plotted on the growth/BMI curve of the child to document the current status.

The dietician interviewed the children and parents using structured questionnaires. The baseline questionnaire consisted of three parts: part I – dietary habits; part II – physical activity and part III – well-being. The dietary questionnaire was designed to capture information about food choice, meal pattern and contents, as well as the number of helpings at each meal, and frequency of eating in-between meals. It had 18 questions and was adapted from a questionnaire used in child care (11). To describe the size of portions eaten, pictures of food (12) were used. The child was asked to describe the usual amount of food in his/her 'normal' portion at school and at home and the number of helpings taken. Finally, the dietician provided dietary advice based on the food anamnesis, as a prescription for the family to follow during the coming year. The most common dietary advice given is shown in Table 1. The interview form on physical activity (part II) was created for the project by the physiotherapist, and had 12 structured questions about (life style) activity and inactivity, e.g. how the child got to school, how many hours a day they spent in front of the TV and computer. There were six questions (part III) about the child's well-being (having many friends, being good in school, liking themselves) (13) and one about the opinion of their own body size (14). The forms and treatment model (in Swedish, updated 2005) can be downloaded (15).

At the first meeting with the family (baseline), simple individualized advice regarding diet was given to each child and family, the main principles being limitations of specific foods and/or changes in eating pattern. Suggestions how to increase routine activities (walk or bicycle to school), decrease sedentary behaviour (time in front of TV, computer or video), and increase organized and

Table 1 Number of parents given advice and adherence to advice

Advice given	*Number of parents given stated advice*	*Adherence to advice (%)*
Reduce marmalade jam, fruit cream, rosehip soup	4	4 (100)
Not more than 3 portions of milk products each day (400–600 mL)	15	13 (87)
Eat one portion at home	9	7 (78)
Eat one portion at school	15	10 (67)
Use unsweetened lemonade (max. 10 kcal/dL)	11	7 (64)
Avoid to shop foods that the child would eat between meals	9	5 (56)
Total number of advice given	63	46 (73)

unstructured physical activities (gymnastics in school, activity in leisure time) were also given.

The recommended frequency of follow-up and weight control for the child at school, with parents attending, was once a month during the 1-year period. Besides weighing, this provided an opportunity for questions and discussion between parent/child/nurse. At the 1-year follow-up, the questionnaires were repeated and body weight and height were measured, all by the same person who made the baseline measures. The changes in BMI (none, decrease, increase) were discussed and the parents were asked which of the given advice was most easy to follow for the child and for the family. Interviews for evaluation were made with parents and thereafter with the school nurse. The nurses were working independently and continuously with the families and children throughout the project, while the dietician met the families only at baseline and at follow-up 1 year later.

Methods for evaluation

After 1 year, the parents and school nurses were interviewed with open questions concerning their experiences and feelings about the intervention programme – both positive and negative. The questions to the parents focused on the family's reactions during the intervention and which dietary advice was easiest to adhere to. The school nurses were also asked about the collaboration with the dietician and the child and family.

The protocol was approved by the Ethics Committee of the Medical Faculty of Lund University, Sweden. All families gave their consent to participate.

Calculations and statistics

Body mass index was calculated from measured weight and height. BMI *z*-scores was calculated as *z*-score for measured value = (attained value − mean standard value for age)/SD of value (9, 10). Individual changes in *z*-score for intervened and reference children are presented. An arbitrary limit of ±0.1 was chosen as indicator of unchanged *z*-score. (The p-values in Table 3 justify this limit in intervened children). Within and between group differences are tested with paired and un-paired Student's *t*-test respectively.

Results

The study took place in 13 schools and included 14 girls and six boys and their families. All children were born in 1994. Three girls did not answer the questionnaire at the 1-year follow-up.

During the intervention year the children had a median of 5 (range 1–12) visits to the SCC nurse, four (range 1–9) of them accompanied by their parent(s). For two children, the parents never took part at the follow-up visits.

Changes in nutrition, activity and well-being after 1 year of intervention

According to the questionnaire the mean consumption of sweet fruit juice was reduced in 40% of children at the follow-up. Fourteen children used unsweetened lemonade instead of sweetened compared to six before the intervention. Ten children had reduced the numbers or sizes of food portions at school; at home four children had made such changes. At baseline the consumption of milk was high, up to 1000–1500 mL/day, and had decreased to 400–600 mL/day at follow-up, mostly low fat milk (0.5–1.5% fat).

Before intervention six children went to school by car or bus, 12 walked and two bicycled. At follow-up the numbers of children per activity were four, 10 and six respectively. All children took part in the physical training at school. Number of gym lessons was more than twice a week for four of the children before intervention, and for 10 at follow-up The number of daily hours of TV viewing was reduced 2.9–2.2; in those using video games or a personal computer (nine children) the time spent changed from 1.2 to 1.4 hours/day. At follow-up, seven children had physical training in sport clubs, compared to three children before the intervention. To sum up, eight of the children had reduced their sedentary activities; four of them at the same time had increased their physical activity to some degree.

Most children gave the same answers to part III of the questionnaire (well-being) before and after the year of intervention. Eighteen children felt great (having many friends, being good in school, liking themselves, having just the right body size for their age), but 10 got easily angry. At follow-up, five girls could not answer the question about own body size; four felt they were unchanged, three felt smaller and two felt bigger than the year before. Of the boys one felt that he had an unchanged body size, three felt smaller and two felt larger than the year before.

Which dietary advice was most easily followed?

In most cases a small number (i.e. 1–4) of individualized dietary advice were given. According to interviews with parents (Table 1), reducing sugar consumption such as marmalade, fruit cream and the like was most easy to adhere to. To serve fewer portions of milk and to eat only one serving per meal at home was also easy. More difficult to accomplish was to restrict the food intake in school, to drink light lemonade (unsweetened) instead of sweetened and to avoid shopping cookies, candies and chocolate. In general, three out of four the dietary advice given were followed during the intervention, however, the variation in adherence between individuals was considerable.

Growth and BMI

In the year between screening and start of intervention (baseline), the children increased in height and weight, Table 2. The mean *z*-score did not change significantly in the intervention group. No data was available for the reference group. After the 1-year intervention (follow-up 2003) mean *z*-score decreased with 0.16 (p = 0.03).

Comparing the growth changes in intervention and reference children during the 2 years of observation, 2001–2003, no apparent differences were found in individual or mean values respectively (Fig. 1 and Table 2). On a group basis the mean difference in *z*-score over the years was −0.05 for intervened and 0.04 for reference children (p = 0.51, NS).

Change in BMI z-score in relation to dietary adherence and number of visits at the SCC

The mean number of dietary advice given did not differ between children reducing BMI *z*-score (n = 12) and those with unchanged *z*-score (n = 7). The adherence was significantly higher in the reducing children, 91% and 54% respectively (p < 0.02) (Table 3). The children who decreased in *z*-score made 5.3 (SD 3.1) visits to the nurse, for 65% of them, accompanied by parents. The seven children with unchanged *z*-scores made 7.1 (SD 2.4) visits, for 84%, with parents. Children who decreased in *z*-score were thus characterized by good adherence to dietary advice. No relationship could be shown between the number of visits to SCC and weight development.

Evaluation of the school nurse training and their experiences postintervention

Three of 15 nurses did not answer the questionnaire about the training, eight were satisfied with the information, and four felt that the information was insufficient. These four nurses wanted more instructions about nutrition and dietary advice, more distinct guidelines with regard to the project and how to work with the family in order to motivate the child. Four nurses wanted more time for questions and reflections. Eleven of the nurses were satisfied with the joint group work with the psychologist and dietician, while two nurses did not take part and two wanted even more concrete discussions about diet and physical activity.

The interview after the intervention period showed that all nurses had some positive comments about the project. 'It has been easier to get the parents to come and visit at school'. 'I have learned from the dietician how to work concretely and practically with nutritional advice'. The nurses had become more self-confident in their role as 'health adviser' and were convinced about the need of speaking directly to the parents about making necessary

Table 2 Mean (SD) of age, weight, height, BMI and *z*-score at screening, baseline and follow-up in 20 overweight (Int, intervention group) and 19 untreated overweight (Ref, reference group) schoolchildren

	Age (years) *Int*	*Age (years)* *Ref*	*Weight (kg)* *Int*	*Weight (kg)* *Ref*	*Height (cm)* *Int*	*Height (cm)* *Ref*	*BMI (kg/m²)* Int	*BMI (kg/m²)* Ref	*BMI z-score* *Int*	*BMI z-score* *Ref*
Screening, 2001	7.0 (0.3)	7.0 (0.4)	31.9 (3.0)	32.7 (3.3)	126.7 (5.7)	128.3 (5.1)	19.8 (0.5)	19.8 (0.7)	2.23 (0.3)	2.26 (0.3)
Baseline, 2002	8.1 (0.4)	–	37.5 (4.5)	–	133.2 (5.1)	–	21.1 (1.6)	–	2.34 (0.5)	–
Difference 2001–2002	1.0 (0.3)	–	5.6 (3.0)	–	6.4 (1.9)	–	1.3 (1.5)	–	0.11 NS (0.4)*	–
Follow-up, 2003	9.1 (0.4)	9.2 (0.5)	41.9 (5.1)	42.8 (7.7)	138.9 (5.0)	139.2 (7.2)	21.7 (1.9)	22.0 (2.0)	2.18 (0.6)	2.30 (0.6)
Difference 2002–2003	1.1 (0.2)	–	4.4 (2.0)	–	5.8 (1.3)	–	0.6 (0.9)	–	**−0.16** (0.3)**	–
Difference 2001–2003	2.1 (0.3)	2.2 (0.4)	10.0 (3.7)	10.9 (3.6)	12.2 (2.2)	11.1 (5.1)	1.9 (1.7)	2.1 (1.5)	−0.05 NS (0.5)***	0.04 NS (0.3)****

For the reference group, data is available at screening and 2-years later.
*p = 0.24; **p = 0.03; ***p = 0.66, NS.

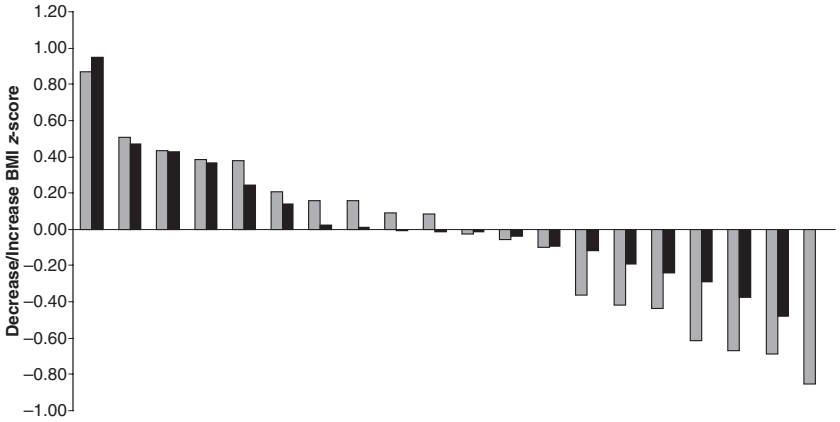

Figure 1 Individual (differences) changes in BMI *z*-score in intervened (grey) and reference (black) children after 2 years of observation (2001–2003).

Table 3 The relation between change in BMI *z*-score, life-style and number of visits at SCC in intervened children

Change in BMI z-score	*No. children*	*Change in BMI z-score*	*No. dietary advice given*	*No. dietary advice adhered to*	*Adherence %*	*No. visits to SCC*	*No. visits to SCC with parents*	*% of visits with parents*
Reduced (>–0.1)	12	–0.33 (0.18)*	4.2 (1.9)	3.5 (1.1)**	91 (20.2)***	5.3 (3.1)	3.1 (2.2)***	65 (–42)
Unchanged (≤–0.1 to 0.1)	7	0.02 (0.04)*	4.3 (1.3)	2.0 (1.5)**	54 (42.3)***	7.1 (2.4)	5.7 (1.9)***	84 (–22)
Increased (>0.1)	1	0.67	4.0	2.0	50	8 .0	6.0	75

Mean values of BMI *z*-scores.
*p < 0.0001; **p = 0.02; ***p < 0.02.

lifestyle changes, in contrast to previously 'shying away' from addressing this issue. 'Before, we handed over problems to the school physician' or 'I now have more courage, previously I was afraid of saying anything to the parents about this problem' were two comments. However, many of the nurses considered that continuous co-operation with the paediatric clinic and the dietician was necessary, also during the follow-up year.

Seven nurses had negative points of view, thereof three of them perceived the project to be burdensome. One nurse mentioned that it was good with a small number of families to treat; with a greater number, e.g. 10 children, it would however have been too laborious. Another problem was that parents often missed the appointments at the school, and let the child meet the nurse on their own.

Experiences from parents postintervention

All families mentioned some positive effects of the intervention: they reflected more while shopping; they considered it favourable that 'another' adult could tell their child how to eat. 'It has been positive to take part in the project and to get support from you' (seven persons). 'I liked to see the BMI-curve, and learn that this in fact can influence the future weight. A long-term effort!' 'It was good with the visits to the school nurse' (two persons). 'I think it is important to go on meeting with you for 4 years' (two persons). 'My daughter is more cheerful, and now she wants to take part in the gym lessons'. 'I have told my children that we are learning to eat in the right way – in fact, everybody should take part in projects like this. We really got something to think about at this information meeting at the SCC. We have changed a lot since this meeting, reduced lemonade and my daughter now eats breakfast. In fact, an extra 3–5 kg is considerable on a small child'.

Thirteen families had negative experiences. According to five parents their children were stigmatized by the project in various ways. 'My son became weight fixated'; 'My daughter did not eat her birthday cake, she felt fat and disgusting and said that nobody wanted to play with her'; 'Sometimes my son told me he has to reduce his weight, or he is teased because he cannot run as fast as other children, they call him fat' (two persons); 'It has been bothersome for my daughter with the visits to the school nurse. Other children asked her where she was going'. Four parents sometimes found it difficult, as the child got very angry when the size of food servings and candy consumption was limited. Regarding meetings with the nurse: two mothers said in the interview 'I didn't feel it necessary to be present at every visit to the school nurse, only weighing and no new tips or ideas were given' and 'I have asked for a referral note to meet a dietician, but haven't received one'.

Discussion

Several studies (3, 5) discuss the benefits and drawbacks of school-based programmes in the battle against overweight and obesity in children and adolescents. This intervention programme was effective in hampering weight gain, and further, it promoted a healthy diet and an increase in physical activity in school-aged children. Similar results are found in much larger intervention studies aimed at the prevention of obesity in children (3).

In this study, an intervention model was tested where school nurses and a dietician worked together with overweight children. Training directed at school nurses by a healthcare team helped to prepare the nurses for their task. Prior to the project, few of the nurses dared to work with the obese or overweight children in school. This may be partly explained by lack of knowledge of how to address the problem (8). For the school nurse, the individual meetings with family and child together with the dietician, was an occasion to study how a dietician works with overweight children. At the same time the meetings were opportunities for the nurses to learn more about food and nutrition and counselling methods that could fill their knowledge gaps. Comments given by nurses indicate that this was appreciated.

It proved to be difficult for all the nurses to attend the offered meetings for information and training. More time for the teamwork and a follow-up discussion with a psychologist and dietician would be advisable and even necessary to provide sufficient time for questions/discussions which in turn would support the nurses to be self-confident in their role in the prevention of childhood overweight and obesity. We could not be sure that all of the nurses received the same knowledge at baseline, but the majority seemed to be interested to continue working with childhood overweight in the SCCs.

Most children with overweight in the current study responded that they generally felt well; with the exception that they often felt teased by their schoolmates and that they easily got angry. According to the parents, five of the children were stigmatized by the project in various ways; as they felt fat, disgusting, were fixated with their weight or were troubled by visiting the nurse for weighing during school hours. The actual intervention may have made the girls more conscious about their body shape.

In general, the parents were eager to serve 'safe' foods to their children. They often declared, 'It shall be real butter and milk and nothing fake like light products'. None of the parents were used to buying unsweetened drinks for the child, mainly because they believed that the sweeteners could cause cancer. Some parents declared that all the family members had tried to change their food habits in a positive way. In fact, one of the mothers reduced her own body weight with 12 kg during the intervention period. There were, however, general problems in reducing the amount of food, finding alternatives to between-meal foods and for celebrations/festivities. Comments from a few parents during the follow-up phase indicate that a direct contact with a dietician would have been appreciated.

When a child gets older, the parents increase their working time outside the home; the child is bicycling alone to school, reading more books and magazines. At follow-up, the children were alone at home a greater part of the day, and – consequently, the parents had little or no control over the child's between meal eating, nor did they know how much time the child spent in front of the TV as similarly seen in other studies (16, 17).

We do not have information about the children's family members' presence of overweight or habits of physical activity. Certainly the children and families had varying needs of help and support from the school nurse and dietician, perhaps depending on the occurrence of obesity in the family. The number of visits at the SCC may reflect great differences in the need for help and advice from the nurse. Comments from two mothers support the need for more professional dietary advice, given by a dietician or a by nurse with a more solid knowledge in nutrition. Experiences from obesity treatment programmes suggest that for some adults it is the participation in weight controls and encouragement at follow-up which can lead to success (18) – whether the same applies for children is unclear. Many of the parents experienced difficulties in limiting their child's food intake, were afraid to 'make an affair' of it, and did not want to have conflicts. They considered it favourable that another adult could tell their child how to eat. For some children and parents the initial information and a few, simple and individualized dietary and life-style advice apparently was enough to instigate change.

There are several weaknesses with the study, one being the low participation of parents and children (30% of the overweight children) in the intervention programme. The reasons for this can only be speculated. Possibly the families did not consider the overweight as a problem at all. Overweight in children is difficult to diagnose, and – as long as the child does not look fat – can the parents really accept the diagnosis? (19). In the present study, a few nurses maintained that some of the parents were very irritated when they were phoned about participation in the project. Further, an increased awareness or fear of the risk for development of an eating disorder, e.g. anorexia, could be a reason to avoid taking part – or a wait and see attitude (20). Another reason could be a fear for stigmatization, considering the intervention design with visits to the nurse during school hours (21). The comments from some of the parents do indicate that this was a reality in this project.

Another weakness is the absence of a control group. Our 'reference group' consisted of overweight children who had taken part in the screening and had been offered an intervention by the SCC but declined to participate in the intervention phase. As there has been intense discussion

about the risks of childhood overweight and obesity in the community during recent years, even the reference group could have been influenced to make change in lifestyle habits. In fact, two-thirds of the reference children had maintained or decreased their *z*-score to some degree (Fig. 1). It is possible that in some families, merely the knowledge about the presence of overweight could be an incitement to make some life-style changes (22). The positive side of the coin, however, that change in fact can be attained by small means and by information from a reliable quarter, should not be underrated.

General problem with a low participation rate in this type of investigations calls for special strategies to reach and convince the parents and children about the necessity to take part in interventions, aiming to prevent obesity in their children. This type of studies is thus needed to get further (searching for special strategies).

Conclusion

Food habits and life-style practices in overweight younger children is possible to modify utilizing rather minimal inputs, including simple dietary advice and periodic follow-up. We found that providing school nurses with knowledge to address the problem and working in collaboration with dieticians and a healthcare team can be an effective means to treat overweight and prevent obesity in school-age children. The model used in this small study could be a natural part in the work of school nurses, informing about health and environment, but it needs further large-scale and long-time follow-up, which is going on. However, possibility of stigmatization was expressed. Thus, efforts will need to be made to carry out such a programme to preserve the children's integrity and run activities in a discrete manner in the school environment.

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