

## Obesity intervention on the healthy lifestyle in childhood: results of the PRESTO (PrEvention STudy of Obesity) Study

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### Abstract

**Background:** Due to increasing problems with childhood and adolescent obesity in Austria PRESTO (PrEvention STudy of Obesity) created a school based intervention program for promoting a healthy lifestyle in Austrian youth.

**Methods:** PRESTO was carried out by a multi-disciplinary team including a physician, a psychologist, a nutritionist and an exercise physiologist. The study was carried out in 12 first grade school classes in Austria (2002-2004), mainly in Vienna (N=260). The control group consisted of 231 subjects. Medical examinations were performed and the participants' knowledge on good nutrition and dietary habits were collected. Twelve nutrition sessions, one hour per week in each class, were conducted. Teachers were advised to discuss health issues in their classes and specific exercise physiologists were informed about how to integrate appropriate exercises into their lessons.

**Results:** In comparison with control group, classes who performed PRESTO showed a significant knowledge of nutrition, consuming less unhealthy foods. These effects could be observed in the short term (14 weeks) and at follow up (10 months). 24% subjects could be classified as being overweight (BMI  $\geq 90$ .Perc.).

**Conclusions:** School-oriented intervention programs/studies, like PRESTO, are a potential way to demonstrate positive effect on nutrition, physical activity and healthy behaviours in youth, especially if carried out on a long-term basis. Ultimately PRESTO has proven to be a suitable programme to be disseminated onto schools throughout Austria.

*Key words: prevention, children, obesity*

### Introduction

The "European Childhood Obesity Group" (ECOG), published a position paper defining childhood obesity as "the major health problem and an uncontrolled world wide epidemic" [1].

Unfortunately, little attention has been paid to prevention, particularly in Europe. To the best of our knowledge 10 evaluated prevention programmes can be identified in the literature [2,6]. So far prevention programs [2,6] have not showed the desired effect of reducing the number of overweight children. In Austria a pilot study called PRESTO (PrEvention STudy of Obesity) was developed and performed in Viennese schools.

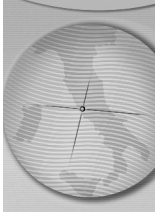
The primary aims of the present study were to evaluate if "PRESTO" could increase the subjects' nutrition knowledge and/or influence eating habits, the secondary aims were to influence

children's' lifestyle as well as change physical activity and the BMI in overweight children. PRESTO was approved by the ethical committee.

### Methods

#### **Subjects, Randomization**

In order to ensure that group assignment could not be predicted, each class had the same equal chance of being assigned to a given group. The schools and classes were randomly chosen and selected out of the index of all schools for Vienna (out of an excess file) for 10-11 year old subjects. The first selected class functioned as a control group (CG), the second as an intervention group (IG) and so on. At the beginning 20 classes with 618 subjects in total had been contacted. All classes wanted to participate, so all our first selected classes were taken into the PRESTO



study. In total 491 subjects took part: 260 of the contacted parents (85%) in the intervention schools and 231 (74%) in the control group allowed their children to participate.

- Assessed for eligibility: 20 classes, 618 subjects
- Excluded: refused to participate (N=127 subjects)
- Randomised: 20 classes (N= 491 subjects)
- Allocated to IG (N=10 classes), to CG (N=10 classes)
- Participating rate (because of parents consent), IG (N=260, 85%), CG (N=231, 74%)

### **Study design**

PRESTO is designed as a 2 year randomized, controlled, not blind study for 10-11year old subjects (2002-2004). PRESTO was initially carried out in 10 classes in Vienna (Austria) as well as a class in Lower Austria and a class in Upper Austria and in 10 control-classes (no intervention). We chose a school based intervention, because of the group approach and having children in a structured institution.

#### *Hypothesis*

Our Hypotheses were that the prevention programme "PRESTO" could increase the subjects' nutrition knowledge and/or influence eating habits and secondly change physical activity and the BMI in overweight children.

### **Methods and Training**

- A newly developed nutrition knowledge test referring to topics taught during the project. It was doubled checked to ensure that all of the items in the tests were actually taught during the lessons.
- A 3-day dietary record to assess eating habits, filled out by subjects
- a complete health examination: anthropometric assessment of weight (kg), height (cm), BMI (body Mass Index kg/m<sup>2</sup>)
- Questionnaires for both parents and children

In order to evaluate the progress and success of the intervention, measures were taken before the intervention and at 14 weeks and after 10 months.

### **Intervention**

During the school year a multi-professional team comprising of a physician, a psychologist, a nutritionist and exercise physiology performed the school-oriented intervention. The project lessons consisted of 12 sessions, one hour per week in each class (9 nutrition and 2 health related lessons) and one final session with a healthy school lunch. In fact, the lessons concentrated more on food groups rather than

on conveying knowledge about nutrients. A playful, experience-oriented learning, through sensory exercises was preferred to its cognitive counterpart. Innovative approaches were used:

- The election of a "Health-Spokesperson", as a representative similar to a class president in order to make the subjects aware that health is really important, (approach of peer - education).
- The subject of nutrition should not just disappear from the agenda at the end of the intervention program, which is why the teachers were provided with further materials (i.e. additional worksheets, texts, background information).
- A concept for an active day with physical activity was designed in cooperation with the Department of Sports Science of the University of Vienna. The exercise physiologists received advice on adequate physical exercises for their lessons, in which even obese children can take part without any problems and can even keep up with their peers.
- Moreover, the subjects could participate in a "competition of ideas", that was the great closing event (i.e. drawings, reports, videos, songs, plays, surveys).
- After the PRESTO-project had finished, they all received the "PRESTO project newspaper" including a report on the project events, photos, nutritional guidelines, the "Healthy Life" Pyramid, and some recipes for healthy school snacks.

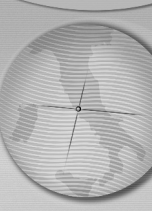
### **Statistical Analysis**

The collected data was entered and analyzed via SPSS and done in cooperation with the Institute of Medical Statistics and the Austrian Research Platform of Child's Health Support. Anthropometric data was analysed according to the Kromeyer-Hauschild-percentiles for the BMI [7]. The results of descriptive analysis were tested two-sided at a 5% level of significance ( $p < 0.050$ ). Differences between the groups (intervention vs. control, boys vs. girls, underweight/normal weight vs. overweight subjects) were elicited with the one-sample t-test for metric data. Differences in indication of frequency were calculated with chi-square-tests. Statistical significance was fixed at 0.05.

### **Results**

#### **Baseline data**

Table 1 describes intervention schools and control schools. As it is shown, our 491 subjects (264 female, 227 male) were  $11.1 \pm 0.6$  years old,

**Table 1. Intervention vs. control group: characteristics**

	Intervention group (IG)	Control group (CG)	Whole group
n_participating pupils	260 (85%)	231 (74%)	491
n_girls	140 (54%)	124 (54%)	164
n_boys	120 (46%)	107 (46%)	127
age (years)	11,1 ± 0,6	11,1 ± 0,6	11,1
weight (kg)	42,7 ± 10	41,7 ± 9,4	42,2
height (cm)	147,3 ± 7	146,4 ± 7,5	146,8
BMI (kg/m <sup>2</sup> )	19,5 ± 3,7	19,3 ± 3,3	19,4
BMI-SDS	0,51 ± 1,1	0,47 ± 1,01	0,49

had a BMI of 19.4±3.5 (BMI-SDS of 0.49±1). IG and CG are comparable (no significant differences).

#### **Nutrition knowledge**

Before the intervention the subject's knowledge about nutrition was collected via a nutrition quiz. Considering normal weight/overweight/obesity we found no difference in knowledge between overweight and normal weight subjects.

Females could significantly better separate fruit-groups and estimate fat intake than boys, boys were better at choosing the right energy intake.

#### **Eating habits**

Eating habits analysis was done through assigning the food and the meal components to the various groups of food according to the "Healthy Life" Pyramid [8]. All subjects filled in a 3-day dietary record (2 weekdays, 1 weekend day). The assessment was analysed by a nutritionist. Through the stating of daily consumption frequencies of different food groups and the resulting calculation of score-sums, eating behaviour can be characterized along two dimensions:

Score_unfavorable food	= Sum of the average, daily consumption of those groups of food which should be decreased due to intervention (= top of food pyramid: French fries, meat, sausages, eggs, sweets and pastries, desserts, crisps, fast food, baked food, etc.)
Score_favorable food	= Sum of the average, daily consumption of those groups of food, which should be increased due to intervention (= base of pyramid: breakfast, snacks, grain products and cereals, side dishes (except French fries), fruits, vegetables, dairy products, cheese, fish, potatoes, etc.)

The assessment of eating habits proved to be fairly inadequate, especially with subjects of lower economic status (p=0.005).

#### **Physical activity habits**

9% of under-/ normal weight children and 15% of the overweight children do not practice any kind of sport, 27% practise at least one type of sport (vs. 38%), 15% two (vs. 13%), 17% three (vs. 15%) and 32% (vs. 19%) practice >4 kinds of sports (p<0.02).

Among all children who do not practice any physical activity other than at school, 73% have mothers with a lower educational level.

#### **Results of the clinical assessment**

Table 2 shows the prevalence of those overweight. 24% of all subjects in the PRESTO study were classified as overweight (BMI ≥90.), with a similar distribution in the intervention and control groups and with no difference between boys and girls.

While 74% of overweight children have parents with low education, only 56% of normal weight children have low educated parents (p<0.001). 60% of overweight children speak another mother language than German, compared to 35% of normal weight p<0.001.

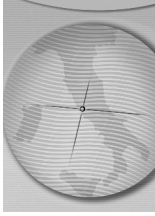
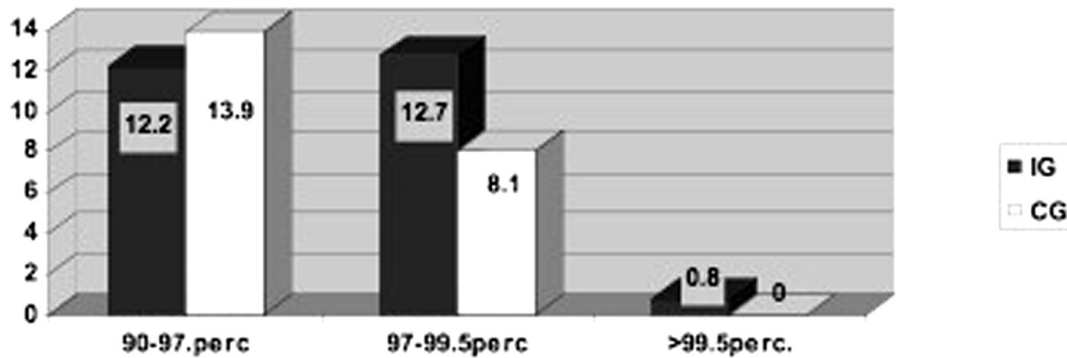


Table 2. Prevalence data (%) from the PRESTO sample, for IG (Intervention group) and CG (Controlgroup)



### Nutrition knowledge

The test was replicated after the project by 89% and after ten months by 82%.

- After intervention subjects in the intervention group (=IG) in contrast to the control group (=CG) showed a significant increase in the achieved total points of the nutrition quiz ( $3 \pm 3.4$  vs.  $0.4 \pm 3.2$  points;  $p < 0.001$ ). Additionally, long-term controls still indicate a rather significant rise concerning nutrition knowledge with Intervention group subjects in contrast to subjects from the Control group ( $2.5 \pm 3.4$  vs.  $1.3 \pm 3.3$  points;  $p < 0.001$ ). The percentage of subjects with all correct answers in the IG doubled, where as in the CG it remained the same. Subjects, who knew before the intervention less, achieved a significantly higher point increase than pupils, who already knew more than the average. After the intervention 25% more subjects could estimate the necessary drinking quantity correctly, 33.7% more subjects understand how digestion works or 19.8% more subjects could give the right answer to the energy balance. No differences were found between under/normal weight and over-weight pupils regarding knowledge in total. Girls could improve their knowledge (after intervention

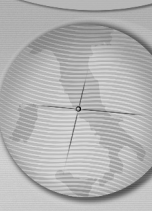
and follow up) significantly ( $p < 0.001$ ), while boys could only at short time achieve a significantly higher knowledge. It seems, that girls could retain the nutrition related information gained from the intervention longer than boys.

### Short-term and long-term changes of eating habits after intervention

- Immediately after the intervention, subjects consumed unfavourable foods significantly less frequently (Score\_unfavourable food decreased from 3.3 to 2.6;  $p < 0.001$ ), especially in those who were underweight and normal weight. Under-Normal weight subjects consumed favourable foods more often than overweight subjects (Score\_favourable food: 7.5 vs. 5.9;  $p < 0.001$ ).
- These effects of the intervention could still be recognized at the time of the long-term control. Subjects still consumed unfavourable foods significantly less frequently (Score of unfavourable foods decreased from 3.5 to 2.8 ab;  $p < 0.001$ ), predominantly under- and normal weight subjects.
- Girls consumed unfavourable foods significantly less frequently than boys immediately after and at the time of the long-term control.

Table 3. Results from Nutrition quiz after Intervention and follow up (MW $\pm$ sd).

	After Intervention			Follow up		
	IG (n=232)	CG (n=196)	p	IG (n=214)	CG (n=177)	p
<b>TOTAL points</b>	+ 3.0 ( $\pm$ 3.4)	+ 0.4 ( $\pm$ 3.2)	< 0.001	+ 2.5 ( $\pm$ 3.4)	+ 1.3 ( $\pm$ 3.3)	< 0.001
<b>female</b>	+ 3.0 ( $\pm$ 3.5)	+ 0.8 ( $\pm$ 3.0)	< 0.001	+ 2.7 ( $\pm$ 3.4)	+ 1.1 ( $\pm$ 3.2)	0.001
<b>male</b>	+ 3.0 ( $\pm$ 3.3)	- 0.1 ( $\pm$ 3.4)	< 0.001	+ 2.3 ( $\pm$ 3.5)	+ 1.5 ( $\pm$ 3.4)	0.114
<b>&lt; 90.Perc.</b>	+ 3.0 ( $\pm$ 3.4)	+ 0.5 ( $\pm$ 3.3)	< 0.001	+ 2.5 ( $\pm$ 3.3)	+ 1.5 ( $\pm$ 3.5)	0.010
<b><math>\geq</math> 90.Perc.</b>	+ 2.8 ( $\pm$ 3.7)	+ 0.4 ( $\pm$ 2.8)	0.001	+ 2.4 ( $\pm$ 3.6)	+ 0.9 ( $\pm$ 2.6)	0.027



### **Physical activity**

All subjects from IG were offered a special day with physical activity possibilities in a Sport Centre of the University. Participating rate was about 85%. All subjects tested 12 different sport activities, P.E. and ball-sports.

### **Short-term and long-term changes of the BMI-SDS in overweight after intervention**

Overweight subjects in intervention schools in contrast to the control schools achieved no significant reduction of the BMI-SDS. Also long-term control showed no significant BMI-SDS changes. Also under-normal weight subjects showed no significant changes in their BMI-SDS.

### **Acceptability of the students and teachers**

After the project had been completed, students and teachers were interviewed by means of evaluation-sheets: 94% of the subjects stated to have gained new information. 94% also considered it necessary to learn about nutrition, 82% would like to participate again next year. 88.5% of the evaluations of the project ranged from "very good" to "good". 84% of the teachers rated the project and 100% rated the idea of the health-spokesperson from "very good" to "good".

### **Discussion**

The school intervention program PRESTO showed a positive influence on the knowledge of all children as well as the eating habits especially of children with normal weight and girls in particular. These effects actually continued over 10 months. Unfortunately, we could not reach a change of overweight children's BMI.

In comparison with other studies, PRESTO used new didactic techniques such as the project newsletter, the idea contest, a sports event, and the election of a health-spokesperson and tried to intense cooperation with the school physicians. The offer of a complete health examination free of charge can be found in only PRESTO.

We found, that children in the intervention group did not significantly reduce their BMI-SDS during the intervention, the same was found in the Pathways Study-Obesity Prevention in American Indian Schoolchildren [9], KOPS-Kieler Adipositaspräventionsstudie [3] and the APPLES study. Other intervention [10] suggested that children's BMI in the intervention group stayed the same and was rising in the control group, or only girls could significantly reduce it (e.g. Planet Health Study). Actually, to compare results from the KOPS Study with PRESTO is very difficult, because in the German study the interventions

were done by home visits.

In the APPLES Study [11,12] and the Planet Health Study [3] children ate more vegetables and fruits after the intervention, whereas children in our study reduced their consumption of "unfavourable" foods in total.

Flodmark [13] et al. published a systematic review about obesity preventing strategies in children and adolescents (2006). Only 3 out of the 10 programs had a positive effect on preventing obesity, in 7 studies no differences between the intervention and control groups were found. In PRESTO there was also no effect on the BMI, but a difference in knowledge and behaviour.

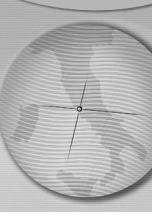
### **Conclusions**

Looking at our results we found that eating habits and the knowledge of children about diet can definitely be improved, the change of weight of overweight children does not seem to be influenced by this short-term intervention program, the knowledge about a healthy diet can be increased through intervention and schools and educators can be made aware of the topics diet-physical activity-health.

Our prevention project study was partially successful way in some areas (PE and an increase of knowledge). PRESTO should be developed with an advanced approach, with repeated interventions in the participating school classes. It should be expanded into other schools across Austria and even to different countries.

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