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Theory-informed nutrition education curriculum Tools For Feeling Good promotes healthy eating patterns among fifth grade pupils: cross-sectional study

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Abstract

**Background:** The eating patterns of school-aged children rarely meet recommendations: meal frequency is irregular and consumption of vegetables is lower and sugar-sweetened products higher than recommended. While school is an excellent arena for nutrition education to support pupils eating patterns, teachers usually lack efficient tools. The aim of the current study was to develop a curriculum for nutrition education to be used by teachers and to examine its efficacy in the school environment with respect to pupils’ eating patterns.

**Methods:** The curriculum was developed in collaboration with schoolteachers using self-determination theory as a theoretical standpoint. The Health at Every Size concept and sensory-based food education were utilized in the curriculum. Self-reported questionnaires were used to assess the feasibility and impact of the curriculum. Fourteen teachers implemented the curriculum during 2012-2013 with 194 pupils aged 10-13 years (5th and 6th grades). The control schools included 140 pupils of the same age not following the curriculum.

**Results:** The teachers reported that the curriculum was easy to integrate in the school environment. The 5th graders improved their breakfast frequency, increased consumption of vegetables and reduced consumption of ice cream, sweets and sugar-sweetened drinks. No improvement was found in the 5th grade pupils – cross-sectional study
graders at the control schools. In the 6th graders, no dietary changes were detected in the intervention or control schools.

**Conclusions:** The pupils in the 5th grade seemed to be a responsive target group for nutrition education at schools. The curriculum offers a promising approach for developing healthy eating patterns among 5th graders. Collaboration with teachers in developing the curriculum likely enhanced its feasibility and teacher commitment for implementation.

**Keywords:** nutrition education, eating patterns, perception of body size, sensory education, Health at Every Size
Introduction

Regular eating patterns of school-aged children are important for their growth and well-being, as well as for the maintenance of normal body weight (1-3). Moreover, eating patterns that are established in childhood continue to also affect well-being during adulthood (3-5).

Although the importance of regular health-promoting eating is well known, eating patterns among school-aged children and adolescents rarely meet Finnish dietary recommendations (6). Meal frequency is irregular and snacking is typical (7). The consumption of vegetables, fruits and whole grain products is lower than recommended, whereas sugar-sweetened beverages, candies, cookies and salty snacks are frequently consumed (8-11). Consequently, various nutrition-related problems are common among school-aged children and adolescents. The prevalence of overweight and obesity has become a major health risk in the Western world (2). Body dissatisfaction is becoming increasingly commonplace, along with dieting and eating disorders (12).

A multitude of factors affect the eating patterns of school-aged children and adolescents (13). Individual factors, such as gender and age, have been found to have an effect, resulting in e.g. girls having a better diet quality compared to boys. Diet quality is also known to deteriorate especially when moving from childhood to adolescence. Environmental factors, such as the family’s eating patterns, are also known to play a significant role.

School is an excellent arena for health promotion and nutrition education, as it reaches practically all children and adolescents. Several school-based health promotion interventions have been conducted with varying results (14-24). Many earlier interventions relied on providing information (i.e. lectures) to increase knowledge of health-promoting eating patterns (16, 20, 21). In addition, functional curricula, book- or web-based practices, farm visits, cooking, taste lessons and sensory education have been used (15-24). Several previously conducted interventions have succeeded in increasing the consumption of vegetables (16, 18, 20, 21) or reducing overweight (22), while others have been unsuccessful in promoting changes in eating patterns (23, 24). Interestingly, interventions using a solely weight-centered approach have been shown to potentially have a negative impact, contributing to increased body dissatisfaction, dieting or even disordered eating (25-28).

The use of a theoretical framework in the development and implementation of a health promotion intervention increases the effectiveness of the intervention (30). For instance, interventions based on the self-determination theory (SDT) (31), the theory of planned behavior (32) and social cognitive theory (33-35) have been found to have positive effects on the eating patterns of school-aged children and youths.
There is a clear need for effective ways to promote healthy eating patterns, like regular meal frequency and consumption of vegetables with no concomitant harmful effects among school-aged children. Therefore, the aim of the current study was to examine the effect of a theory-informed nutrition education intervention integrated in the school’s curriculum on pupils’ eating patterns. The intervention is aimed at improving healthy eating patterns without causing harmful effects to the pupils’ self-esteem and positive body image.

Method

Study design. The study had a cross-sectional study design where the 5th and 6th graders of the intervention schools were compared in parallel to the 5th and 6th grade pupils of the control schools at two points in time (before (May 2012) and after (May 2013) implementation of the curriculum) (Figure 1). This design was chosen to be able to compare the pupils of the same age at the same time of year to rule out any potential effects of growth and maturation, as well as seasonal effects, on the results. The study was conducted according to the guidelines of the Declaration of Helsinki and was approved by the school principals and the University of Eastern Finland Committee on Research Ethics.

Development of the nutrition curriculum. A nutrition curriculum was developed, implemented and evaluated as a part of a local healthy lifestyle promotion program carried out within primary schools in Eastern Finland (Figure 1). The curriculum was developed in cooperation with primary school teachers. In addition, other experts in the field of children’s nutrition, psychology, and education were consulted. The curriculum was developed to promote healthy eating patterns among pupils in the 5th and 6th grades (i.e. pupils aged 10–13 years). The aims of the curriculum included strengthening the autonomic motivation of pupils to enhance their well-being, and supporting health-promoting eating patterns through regular meal frequency as well as increased consumption of vegetables and reduced consumption of sugar-sweetened products. In addition, the curriculum aimed at supporting the development of a healthy self-esteem and body satisfaction. The practices of the curriculum were designed so that they could be implemented by teachers as part of normal school work and integrated into school subjects, such as biology or mother tongue.

In the development of the curriculum, the premises of the self-determination theory (SDT) were utilized to increase the autonomous motivation of the pupils to enhance their well-being (Figure 2). Utilization of SDT was built in the teaching practices, as well as in the actions and methods used in the implementation of the curriculum. A central premise of SDT is that a social context that fulfils...
the basic psychological needs of autonomy, competence and relatedness enhances the person’s autonomous motivation and fosters his or her health and well-being (36). Autonomy refers to the need to experience one’s actions as a result of volitional choices. Competence refers to the generalized need to experience oneself as capable and competent in controlling the environment and being able to reliably predict outcomes. Relatedness, in turn, refers to the need to experience satisfaction in one’s involvement in the social world.

The Health at Every Size (HAES) approach was utilized in the development of the content of the curriculum (25-29). HAES emphasizes the enhancement of healthy lifestyle habits, regardless of body weight. It highlights intuitive eating and especially aims to increase the person’s body satisfaction and, consequently, self-esteem. It also emphasizes respect for individual differences and thus improves the feeling of relatedness.

The Sapere sensory food education method (Classes du goût) was used to increase the pupils’ interest in and curiosity towards foods using all five senses, and to encourage increasing variety in the diet by exposing the pupils to diverse foods (37). The method also encourages pupils to observe their personal sensations and express them verbally. It could be assumed that by highlighting pupils’ individual experiences, the Sapere food education method could increase their sense of autonomy and competence, and providing the pupils with social interaction with their peers could also increase their sense of relatedness.

The mindful eating approach was used to teach the pupils to pay more attention to feeling hunger and satiety to increase internal regulation of food intake and support the development of regular meal frequency (38).

The curriculum was named Tools for Feeling Good. It included eleven exercises, divided into three themes, which were body satisfaction, a health-promoting diet and sensory education on food using all senses (Table 1). In addition, in collaboration with their teachers, the pupils created assignments that supported the themes of the curriculum to be completed as homework (one per week, in total at least six assignments).

Detailed instructions of the aims and implementing the exercises were provided in a manual for the teacher. In turn, the pupils’ manual included detailed descriptions of the exercises. The duration of each exercise was one lesson (45 min), except for exercise number 7 (Healthy snack patterns), which took approximately two hours (Table 1).

**Intervention and control schools.** All primary schools with 5th and 6th grades in the Sotkamo municipality in Eastern Finland were invited to participate in the implementation of the nutrition curriculum in autumn 2012. In total, 14 5th and 6th grade classrooms at six of the eight primary schools
in the area participated in the implementation of the curriculum (Figure 1). They formed the intervention group (n = 194, age range 10–13 years). Two primary schools that did not implement the curriculum and had a comparable number of pupils located in the neighboring municipality served as control schools (n = 192, age range 10–13 years). The formation of the study population is presented in Figure 1.

**Implementation of the curriculum.** The curriculum was pretested in two primary schools before actual implementation. Two teachers with their classes, including in total 34 pupils, participated in the pretesting. Based on the feedback, the curriculum was improved, for example, by clarifying the instructions for the exercises.

Actual implementation of the curriculum began in autumn 2012. Before the implementation, the teachers participated in a 1.5-hour training session on how to use the curriculum. In addition, in January 2013, the teachers had four hours of training about the use of the Sapere food sensory education method prior to implementing the relevant sensory education lessons. The teachers implemented the curriculum as part of their normal school work during a six-month period between October 2012 and March 2013.

**Evaluation of the feasibility and effects of the intervention.** The feasibility and effects of the curriculum were evaluated using two types of measures, which are presented below.

**Feasibility evaluation measures.** To evaluate the feasibility of the curriculum, all teachers (n = 14) and pupils in the intervention schools filled out a feedback questionnaire in spring 2013. The feasibility of the curriculum was evaluated via two feedback questionnaires designed for this study separately directed at teachers and pupils. The feedback questionnaire aimed at teachers included questions on the applicability of the curriculum as part of teaching, the conformity of the content and implementation of the exercises with the aims of each exercise, and the teachers’ willingness to implement the exercises in the future. The feedback questionnaire for pupils inquired about the likeability of the content and exercises of the curriculum, and about the understandability and ease/difficulty of the exercises. Using a dichotomic scale (yes/no), the pupils also reported whether they had learned something new or changed something in their diets or attitudes toward themselves or others after completing the curriculum.

**Outcome evaluation measures.** To evaluate the effectiveness of the curriculum, various questionnaires were used. 114 (59%) pupils from the intervention and 140 (73%) from the control schools filled out the questionnaires before the implementation of the curriculum (spring 2012) and 163 (84%) pupils from the intervention and 107 (56%) from the control schools after its
implementation (spring 2013). An 18-item questionnaire was used to evaluate the effects of the
implementation of the curriculum on the pupils’ dietary patterns, perception of body size, and weight
management efforts. These items were the same as those in the questionnaires by WHO \(^{(39)}\) and the
National Institute for Health and Welfare in Finland \(^{(40)}\) targeted at school-aged children and
adolescents.

Meal and snack frequency and meals consumed during schooldays and weekends were evaluated
with a four-point scale: never, 1–2 times a week, 3–4 times a week, and daily. Breakfast was defined
as a meal consisting of more than a glass of beverage. The amount of snacks was measured using a
five-point scale: 4 or more snacks a day, 3 snacks a day, 1–2 snacks a day, does not eat snacks daily,
hardly ever eats snacks. The type of snack was evaluated with nine categories: bread, dairy products,
fruit or berries, vegetables, sweets or chocolate, ice cream, pastries (cookies, buns or doughnuts), soft
drinks, energy drinks or something else. The frequency of salad consumption with school lunch was
evaluated on a four-point scale: never, 1–2 times a week, 3–4 times a week and daily.

The effect of the curriculum on the pupils’ perception of their body size was evaluated using a five-
point scale: too fat, somewhat fat, appropriate size, somewhat thin and too thin. The possible weight
management efforts during the previous 12 months were also enquired. The pupils additionally
reported their weight and height in the questionnaire (data not reported).

The effect of the curriculum on the pupils’ self-esteem was evaluated with the widely-used \(^{(41)}\)
Rosenberg’s Self-Esteem Scale (RSE) \(^{(42, 43)}\). Responses to ten statements were given on a four-point
Likert scale ranging from ‘fully disagree’ (1) to ‘fully agree’ (4). The theoretical range of the RSE
sum score is from 10 to 40, with higher scores indicating higher self-esteem.

Statistical analyses. Statistical analyses were conducted using the SPSS software package (SPSS for
Windows, version 19.0, Chicago, IL, USA). All the analyses were conducted as cross-sectional
measurements before and after the implementation of the curriculum. Cross-tabulated frequencies
between the intervention schools and the control schools were analyzed by using the chi-squared test.
Pupils at the 5th and 6th grades were tested separately. In the statistical analyses, a p-value < 0.05 was
regarded as statistically significant.

Results

Satisfaction and feasibility of the curriculum. All teachers (n = 14) reported that they had carried
out all of the exercises and integrated them in the school subjects of mother tongue and biology. All
the teachers reported that the exercises were consistent with their aims, inspiring and easy to carry
out with pupils, and that they were also going to keep performing at least some of the exercises in the future. Some of the teachers (n = 4) felt that it was too much work to carry out all eleven exercises during one semester, and that the exercises should be tied more strongly to certain time points of the school year, as well as to the overall school curriculum.

Nearly all of the pupils reported that the exercises were fun (n = 159, 82%) and that they had understood the instructions (n = 182, 94%). Altogether, 69% (n = 134) reported that the degree of difficulty of the exercises was suitable, 29% (n = 56) that the exercises were somewhat or too easy and 2% (n = 4) perceived the exercises as too difficult. Over half of the pupils (n = 124, 64%) reported that they had learned something new by completing the exercises. Almost one third (n = 60, 31%) reported that they had changed something in their diets and 12% (n = 23) that their attitudes towards themselves or others had changed towards a more positive direction as a result of completing the curriculum.

**Impact of the curriculum on eating patterns.** At the intervention schools, a greater percentage of the 5th graders reported eating breakfast after the implementation of the curriculum than before it (Figure 3, p = 0.034). Out of the 5th grade pupils at the intervention schools, the proportion of pupils reporting consuming three or more snacks daily decreased, while the proportion of those eating 1–2 snacks daily increased when comparing cross-sectional measurements before and after the implementation of the curriculum (p = 0.033, Table 2). Among the 6th graders in the intervention and control schools, no significant changes in meal or snacking frequency were observed during the same time period.

Consumption of vegetables as snacks increased (p = 0.043), while the consumption of sweets (p = 0.016), ice cream (p = 0.032), soft drinks or energy drinks (p = 0.001) as snacks was lower among the 5th grade pupils who completed the curriculum (Figure 4). In the same time period, the consumption of bread (p = 0.028) and juice (p = 0.025) as snacks was higher among the 5th grade pupils at the control schools. There were no differences in the types of snacks consumed among the 6th grade pupils in the intervention or control schools.

In the population of 5th graders at the intervention schools, having salad daily as part of school lunch increased from 32% to 68% (p < 0.001) after the implementation of the curriculum. In the control schools, the corresponding percentages were 39% and 17% (p = 0.048). Among the 6th grade pupils, there was no difference in the consumption of salad with school lunch.

**Self-esteem, perception of body size and weight management efforts.** There were no differences in the pupils’ self-esteem, perception of body size or weight management efforts before and after the implementation of the curriculum in either the intervention or control schools.
Discussion

The Tools for Feeling Good curriculum improved breakfast frequency and consumption of vegetables and reduced consumption of ice cream, sweets and sugar-sweetened drinks among the 5th graders, but not among the 6th graders.

The importance of regular meal frequency and internal regulation of eating were emphasized in the Tools for Feeling Good curriculum. Pupils not only acquired information on these issues, but were also able to practice these skills in a concrete manner. For example, they learned to recognize feelings of hunger and satiety by means of mindful eating. In one study, it was shown that mindful eating reduces impulsive food choices in adolescents (44). They evaluated their own eating patterns in light of dietary recommendations, and planned and prepared healthy and tasty snacks for themselves. Increasing the ability of adolescents to link their actions to consequences has also previously been reported to be effective with respect to food choices (31, 45). The health-promoting effects of regular eating are well-known and associated, for example, with a reduced risk of overweight (46), even among individuals with an inherited vulnerability to obesity (47). Therefore, the efforts to promote a healthy lifestyle in childhood have a particular strategic importance for the promotion of health even in adulthood (48, 49). On the other hand, it should be noticed that although meal frequency is important, it loses its beneficial effects unless also healthy food items are included into the diet.

The increased consumption of vegetables (as snacks and as part of the school lunch) among the 5th grade pupils at the intervention schools is a promising result. Finnish school lunch, served to all pupils for free, typically includes a main dish, salad, bread with vegetable oil-based margarine, and milk or sour milk (50, 51). However, earlier research has shown that only a relatively low number of pupils eat all components of their school lunch (10). A functional method, sensory food education, was used in the curriculum to increase consumption of vegetables. For example, the pupils were offered an opportunity to get to know vegetables by using the senses of smell, taste, touch, vision and hearing (the Sapere method). Earlier interventions using the Sapere food education method in nutrition education have also been successful at encouraging children to try new, unfamiliar foods and expand their food repertoire and willingness to choose and taste vegetables (5256). The Tools for Feeling Good curriculum consisting of 11 active lectures was carried out by teachers over the course of six months. Its impact was evaluated only at the end of the curriculum. Thus, there continues to be a need for long-term results to find out whether positive changes in eating patterns achieved by 5th graders are maintained in the long run. As noted in earlier studies, the positive changes tend to be short-lived (52). There is thus a clear need for theory-based interventions covering the entire school age range.
The finding that these beneficial changes were only seen among the 5th graders and not among the 6th graders at the intervention schools deserves attention. The fact that the 6th graders (i.e. 12–13-year-olds) are typically at the threshold of puberty possibly means greater challenges for health promotion. Similar results have also been found in earlier studies, which have reported nutrition and sensory education to be more effective among younger children (52, 54, 55). During puberty, the significance of social groups (friends, peer pressure) and social bias additionally becomes more apparent (58–59). Interventions for this age group should thus be tailored also taking these issues more into consideration.

The Tools for Feeling Good curriculum had no effect on self-esteem, perception of body size or weight management efforts. The curriculum included three exercises concerning body satisfaction utilizing the HAES approach. A previous school-based intervention using the HAES approach suggested that children may benefit from the approach when feeling pressure related to appearance, weight and eating concerns (58). However, the number of three exercises on this topic is relatively low, and in the context of these psychological aspects of well-being (i.e. self-esteem, body satisfaction), there are multiple other factors that are important, including family and peers (61).

In connection with the implementation of the curriculum, a few points should be emphasized. First, the use of SDT as the theoretical background was one strength of the curriculum. This theory has been used also in earlier adolescent health promotion interventions with positive impacts on eating patterns (20–22). Second, the teachers and pupils assisted the development of the curriculum, which is another strengths. The involvement of teachers probably increased their commitment in implementing the curriculum, which is in line with the results of an earlier study (62). All the teachers in the intervention schools implemented all the exercises, and according to their reports, the curriculum was integrated into their normal teaching regime in practice. However, some teachers reported that the implementation of eleven exercises during one semester was too laborious. In itself, carrying out the curriculum’s exercises did not demand preliminary work with the exception of the exercises utilizing the Sapere sensory food education method. For this exercise, the teachers had to go shopping to provide the needed food items and subsequently prepare them and chop them up. However, although these exercises increased the complexity of implementation the curriculum, they were included due to the potential effects of Sapere method to increase vegetable consumption.

The main shortcoming of the current study is its cross-sectional setting. All the pupils responded to the questionnaires anonymously during their usual classes. For practical and ethical reasons, it was thus impossible to identify the pupils in a manner that would have allowed analyzing the potential intervention effects at the individual level. However, this design allowed us to compare pupils of the same age at the same time of year to rule out any potential effects of growth and maturation, as well
as seasonal effects, on the results. Another limitation of the study is that the outcome evaluation measurements were done right after the implementation was finished. To have a better understanding of the results, determinations should be repeated also later. Moreover, the fact that all the pupils were from a fairly small geographical area, which might in turn compromise the applicability of the results to the whole Finnish population.

In conclusion, the Tools for Feeling Good curriculum, which was informed by the premises of SDT and included elements of HAES and sensory education (Sapere), offers a promising tool for schools to promote health-promoting eating patterns, especially among 5th graders. Collaborating with teachers in the development of the curriculum is likely to enhance its feasibility and the commitment of teachers to its implementation.

**Transparency Declaration**

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The reporting of this work follows STROBE guidelines. The lead author affirms that no important aspect of the study have been omitted and that any discrepancies from the study as planned have been explained.

**Reference**


38. Albers S. Eat drink and be mindful: how to end your struggle with mindless eating and start savouring food with intention and joy. Raincoast Books; 2015.


Primary schools in Eastern Finland (8 schools)
Number of pupils: 385 in May 2012 and 385 in May 2013

Intervention schools (6 schools)
Number of pupils: 193 in 2012 and 194 in 2013

Control schools (2 schools)
Number of pupils: 192 in 2012 and 191 in 2013

Before implementation measurements (May 2012)
Eating patterns, self-esteem, perception of body size, weight management efforts

Intervention schools (6 schools)
n=57 5th grade (31 girls and 26 boys)
n=73 6th grade (33 girls and 40 boys)

Control schools (2 schools)
n=77 5th grade (41 girls and 36 boys)
n=63 6th grade (35 girls and 28 boys)

Implementation of the curriculum (6 schools)
Implementation between October 2012 – May 2013
n=14 (teachers), n=194 (pupils)

After implementation measurements (May 2013)
Measurements same as May 2012, in addition
evaluation of curriculum feasibility
n=83 5th grade (43 girls and 40 boys)
n=80 6th grade (40 girls and 40 boys)

After implementation measurements (May 2013)
Measurements same as May 2012.
n=53 5th grade (28 girls and 25 boys)
n=54 6th grade (33 girls and 21 boys)

**Figure 1.** A flow chart of the cross-sectional study design, study population and measurements.
<table>
<thead>
<tr>
<th><strong>Intervention goals</strong></th>
<th><strong>Behavioral goals</strong></th>
<th><strong>Actions and teaching styles used in the curriculum</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomy</td>
<td>Autonomy</td>
<td>Information about health promoting eating patterns. Several choices were offered to put the information into practice.</td>
</tr>
<tr>
<td>motivation to enhance</td>
<td>to make personal</td>
<td>Language that supports a sense of autonomy and reduces a sense of control and pressure was used.</td>
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<td>personal well-being</td>
<td>conclusions and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>decisions.</td>
<td></td>
</tr>
<tr>
<td>Frequent meals</td>
<td>Competence</td>
<td>External rewards were not used.</td>
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<tr>
<td></td>
<td>in implementing</td>
<td></td>
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<tr>
<td></td>
<td>healthy eating</td>
<td></td>
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<tr>
<td></td>
<td>patterns.</td>
<td></td>
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<tr>
<td>Increased</td>
<td>Relatedness</td>
<td>Individual experiences: feelings, sensations and thoughts were highlighted and opportunities were provided for expressing them.</td>
</tr>
<tr>
<td>consumption of vegetables</td>
<td>to social world by</td>
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<td>feeling self-</td>
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<td>well as respect for</td>
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<td></td>
<td>others’ differences.</td>
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<td>Decreased consumption</td>
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<td>of sugar-sweetened</td>
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<td>beverages</td>
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</tbody>
</table>

**Figure 2.** Actions and teaching styles used in the curriculum to enhance the psychological needs of feeling of autonomy, competence and relatedness to increase autonomous motivation and well-being.
<table>
<thead>
<tr>
<th>Themes</th>
<th>Exercises</th>
<th>Implementation</th>
</tr>
</thead>
</table>
| **Strong and healthy self-image** (Body satisfaction) | 1. Familiarization with oneself  
   - Group discussion and identification of one’s own personal features and characteristics.  
2. Effects of genes on one’s personal characteristics  
   - Group discussion and drawing of a family tree illustrating how genetic characteristics run in one’s family.  
3. Influence of the environment on one’s body image  
   - Reading a story on the environmental effects on body image and discussion based on the story. |
| **Food for pleasure and promotion of well-being** | 4. Regular meal frequency and internal regulation of food intake  
   - Group discussion about meal frequency and internal regulation of food intake. Assignments on how meal frequency affects well-being and examination of one’s own meal frequency according to a one-day food diary. Identifying various sensations of hunger.  
5. Diet quality  
   - Examination of one’s own eating patterns and realistic goal-setting based on a one-day food diary.  
6. Familiarization with vegetables, berries and fruits  
   - Familiarization with vegetables, berries and fruits using all senses.  
7. Healthy snack patterns  
   - Becoming acquainted with food labelling and the nutritional value of typical snacks. Planning and preparation of snacks to promote well-being. |
| **Sensory education on food using all senses** | 8. Introduction of all senses  
   - Sensory education; what kind of information senses provide about of food.  
9. Senses of sight and touch  
   - Group tasks where pupil describe food features using senses of sight and touch.  
10. Sense of taste  
   - Learning the five basic tastes.  
11. Sense of smell and hearing  
   - Group tasks where pupil describe and identify different kinds of aromas and identify sounds related to food, eating or food preparation |
Figure 3. Meal frequency among the fifth-grade pupils in the intervention and control schools before (May 2012) and after (May 2013) the implementation of the curriculum. The columns represent the percentages of pupils consuming the noted meals on every school day. Frequencies were generated by cross-tabulations using the chi-square test for statistical significance (*P=0.034).

Table 2. Snacking frequency among the fifth-grade pupils in the intervention and control schools before (May 2012) and after (May 2013) the implementation of the curriculum.

<table>
<thead>
<tr>
<th>Time point</th>
<th>Percentage of pupils (%)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>≥3 daily snacks</td>
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<tr>
<td><strong>Intervention</strong></td>
<td></td>
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<tr>
<td>May 2012, n=49</td>
<td>43</td>
</tr>
<tr>
<td>May 2013, n=80</td>
<td>23</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
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<tr>
<td>May 2012, n=68</td>
<td>27</td>
</tr>
<tr>
<td>May 2013, n=51</td>
<td>18</td>
</tr>
</tbody>
</table>

Frequencies were generated by cross-tabulations using the chi-square test for statistical significance (P=0.033).
**Figure 4.** Types of snacks usually consumed by the 5th grade pupils in the intervention and control schools before (May 2012) and after (May 2013) the implementation of the curriculum. Frequencies were generated by cross-tabulations using the chi-square test for statistical significance (*p<0.05, **p<0.01, ***p<0.001).