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Establishing Dietary Habits during Childhood for Long-Term Weight Control

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Key Words
Children · Eating habits · Nutrition education · Weight control · Obesity · Eating disorders

Abstract
Objective: To review psychosocial research with respect to relevance for the development of nutritional education strategies for optimal weight control during childhood and the longer term. ***Results:*** Recent decades have witnessed changes in the social context of eating, with a trend away from family meals towards grazing and eating alone. At the same time, the prevalence of overweight and obesity is increasing amongst both children and adults, with even young children deliberately practising weight control measures, ranging from selective food choice to self-induced vomiting. Such behaviour is motivated by unrealistic perceptions of healthy body weight and shape. Successful long-term management of healthy body weight is supported by flexible control of eating behaviour and long-term educational strategies. Children are interested in learning about a wide range of nutrition topics. However, to be effective, nutrition education should be appropriate to the stage of cognitive development according to the age of the child, and be placed in the context of the direct, perceivable and immediate benefits resulting from good nutrition. ***Conclusion:*** Educational strategies should focus on consumption of a balanced diet, coupled with provision of a variety of foods, including a range of nutrient-dense 'healthy' food and encouraging children to taste unfamiliar dishes. They should provide a stable and predictive pattern of social eating occasions to promote the social meaning and importance of eating, and to enable social learning of food preferences. Educational strategies should provide orientation and reassurance regarding the range of healthy and acceptable body weights and shapes. They should also encourage flexible control of eating behaviour to enable children to maintain their weight within this healthy range.

Development of Eating Habits

The newborn baby shows innate preference for sweet tastes and innate dislike of sour or bitter tastes [1, 2]. From an evolutionary perspective these innate acceptance patterns serve important biological functions, since in nature sweetness is associated with readily available calories from carbohydrates and bitterness is correlated with toxicity [3]. More directly, the innate preference for

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the sweet taste may reinforce the breast milk consumption of the newborn baby. The classic work of Clara Davis [4, 5], in which children self-selected a healthy diet without being influenced by adults, points to the possibility that human infants possess a biological control system which enables nutritionally adequate food choice, at least when a variety of wholesome and natural foods are available. However, it is not known whether this is also the case when more energy-dense and processed foods are available. Nevertheless, these findings show that human food intake at the beginning of life is, at least partially, controlled by innate biological systems and internal cues.

But from the very beginning these innate preferences are modified by learning processes, and subsequently learning plays a major role in the development of food preferences and food rejections [3, 6]. Three major processes have been described that modify food acceptance patterns of the child. Firstly, the *mere exposure* to unknown food, i.e. the repeated experience of tasting and eating it, reduces the tendency to reject the unknown food, a phenomenon that has been termed *neophobia* [6]. Consequently, the preference for an initially novel food increases with exposure, in children [7], as well as in older college students [8]. Secondly, food acceptance is modified by social influences: children learn to prefer food eaten by adults, by their peers or by fictional heroes in a story [9]. Peer influence may be more powerful than parents' influence, and has been shown to be effective in preschoolers [10] and even in 2-year-old children [9]. Thirdly, children learn to associate the physiological consequences of food intake with taste cues from the food [11, 12]. These learning processes eventually result in cognitive structures and processes, including attitudes towards, and beliefs about food and eating, which play an important role in the control of food intake in adults [13]. A model of the relative importance of these factors over the life span is illustrated in figure 1.

Given the important role of social influences on the development of eating habits, the dramatic change in the social context of eating behaviour has to be recognised and its impact explored. While in the past eating for children has generally been within a social context, such as the family meal, eating alone has now become a common event. The consequences of this development are highlighted by the findings of a recent survey exploring the eating habits and attitudes of 551 schoolchildren aged between 7 and 16 years in Hamburg (Germany). In this survey we found that the importance of the family being present at meals decreased continuously with age. In parallel, the importance of watching television while eating

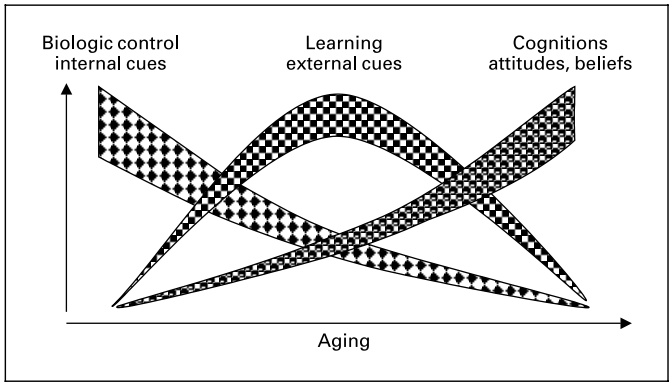

Fig. 1. Three-component model of the development of human intake control [modified from 13].

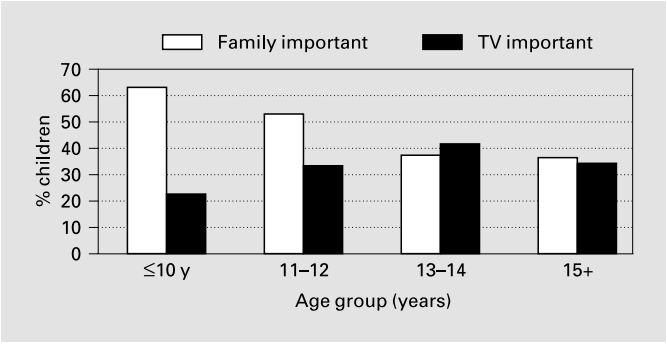

Fig. 2. Percentage of German schoolchildren rating the family being present at meals or watching TV at meals as important.

increased with age. Thus it appears that the family is being replaced by the television as 'social company' at meals (fig. 2). This trend is notable due to evidence that television watching is related to the development of overweight and obesity [14].

Weight Control

Recent decades have witnessed an alarming increase in the prevalence of overweight and obesity in children [15]. At the same time, dissatisfaction with body image has increased – with children as young as 9 years expressing dissatisfaction with their body shapes, even if they are of a normal body weight. Dissatisfaction with body shape is associated with low self-esteem and higher levels of dietary restraint, i.e. deliberate restriction of food intake in order to lose or maintain weight [16]. In a survey of Ham-

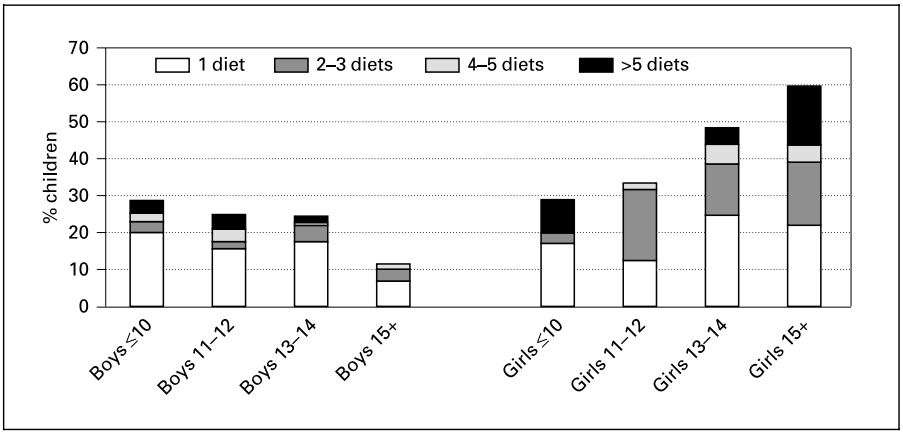

Fig. 3. Diet experience in 7- to 16-year-old schoolchildren in Hamburg (Germany).

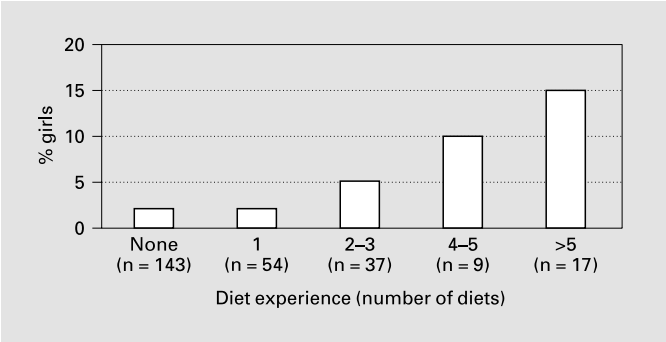

Fig. 4. Percentage of girls reporting vomiting as a measure of weight control dependent on previous dieting experience.

Table 1. Percentage of 7- to 16-year-old schoolchildren using different measures to influence body weight ('What are you doing to influence your body weight?' – multiple answers allowed)

	Boys	Girls
I eat a lot of fruits and vegetables	47.7	61.7
I exercise	55.1	45.4
I eat light products	11.3	8.9
I eat deliberately less than I want	18.0	27.5
I skip meals	11.3	27.5
I avoid products with sugar	15.2	22.7
I go on diets	9.0	20.8
I eat low fat	14.1	17.8
I vomit after eating	0.7	3.7
I eat deliberately protein-rich	11.7	5.9
I eat deliberately more than I want	10.2	4.8
I do nothing	23.4	22.7

burg schoolchildren, we found that only 48% of the boys and 36% of the girls thought that their weight was 'all right'. Thirty percent of the boys and 50% of the girls evaluated themselves as either 'too fat' or 'much too fat'. And even among normal weight boys and girls (21% resp.), 47% thought they were either 'too fat' or 'much too fat'. Obviously, these self-evaluations of body weight are motivated by unrealistic conceptions of healthy body weight and shape. As a result, more than three-quarters reported using one or more measures to influence their body weight. As may be seen in table 1, girls prefer to influence body weight by changing eating habits while boys tend to use more exercise. Among girls there is a remarkably high prevalence of dieting experience, which increases with age (fig. 3). More than half of the girls aged 15 years and above reported having dieted at least once.

Risks of Restrained Eating and Chances of Cognitive Control

One additional important finding was that 3.7% (n = 10) of the girls and 0.7% (n = 2) of the boys admitted to using vomiting as a measure of weight control. It must be assumed that these children already have an eating disorder, or are in the process of developing one. In adults, dieting is considered to be an important risk factor for the development of an eating disorder. The survey of Hamburg's schoolchildren demonstrated a clear relationship between dieting and the use of vomiting as a measure of weight control in girls. There was a clear increase of vomiting with more frequent dieting experience in girls (fig. 4) whereas the two boys with vomiting reported that they had never been on a diet.

Table 2. Behavioural and attitudinal characteristics of rigid and flexible control of eating behaviour

	Rigid control	Flexible control
Overall strategies	'All-or-nothing' approach to food and weight (dichotomous thinking) Frequent but short periods of dieting Dieting periods alternate with periods without weight control efforts	'More-or-less' approach to food and weight Long-term weight management Weight control is a permanent strategy
Behavioural examples	Severe restriction of energy intake Total avoidance of sweets or other liked foods Consumption of foods that are not liked as long as they are low in calories or fat	Deliberate compensation for higher intakes on other occasions Eating sweets in limited amounts with pleasure and without feelings of guilt Preference for low energy or low fat food, but other foods are eaten with pleasure and without guilt from time to time

The relationship between dieting and eating disorders may be more complex than previously assumed. Dieting behaviour is closely related to restrained eating, which has been defined as the tendency to restrict food intake in order to lose weight. In adults it has been shown that two different subtypes of restrained eating can be distinguished: rigid control and flexible control of eating behaviour. The attitudinal and behavioural characteristics of these two subtypes are summarised in table 2. Rigid eating control is associated with more disordered eating patterns and is not predictive of successful weight control, whereas flexible eating control is associated with a lower frequency of eating disorders and more successful weight maintenance. However, it has not been known whether these concepts and relationships are also valid for children.

A recently published retrospective study on behavioural characteristics of successful weight maintenance in obese children investigated the developments in body weight of 291 children and adolescents on an average of 3.5 years after initial inpatient treatment for obesity [17]. This research used a newly developed child version of the Eating Inventory [18] and the scales proposed by Westenhoefer et al. [19] to assess control of eating behaviour. Levels of flexible and rigid control, as well as overall cognitive control (restrained eating) and disinhibition, i.e. the tendency to overeat in the presence of environmental and emotional stimuli, were all measured. The sample was divided into two subgroups: those who successfully maintained or reduced their weight (n = 158) and those who gained weight (n = 133). The group with successful weight maintenance exhibited significantly higher overall cognitive control, as well as higher levels of flexible control of eating behaviour. The rigid control component did not differ significantly between the two groups. The tendency towards disinhibition (which may be considered as a proxy measure of disordered eating patterns) was significantly lower in the successful weight maintenance group. Thus, in this study we found support for the previously suggested relationship between the components of dietary restraint, body weight and eating disorders. While flexible control of eating behaviour is associated with successful long-term weight maintenance, rigid control does not help in the long-term management of body weight.

Limits of Nutrition Education

Given the information presented so far, it is easy to understand that nutrition education must incorporate issues beyond healthy eating and address wider issues such as body image and self-esteem. Nutritional education strategies, especially in the younger age groups, are clearly limited by children's cognitive developmental stage. In particular, younger children will not be able to learn the meaning of abstract terms such as energy or nutrients, and their anticipation of future effects is limited to within a few days. Education regarding the role of healthy eating in the prevention of chronic disorders such as heart disease or cancer will therefore have little impact.

Results of a survey exploring the eating habits and eating attitudes among 10- to 17-year-old schoolchildren in Lower Saxony (Germany) (n = 987) showed that the

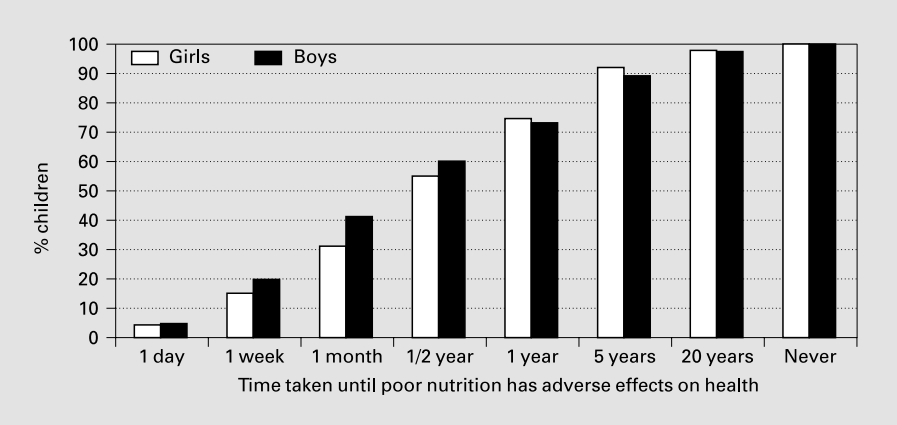

Fig. 5. 'How long does it take until poor nutrition had adverse effects for your health?' Cumulative distribution of the answers of 531 girls and 456 boys aged 10–17 years.

Table 3. Percentage of 7- to 16-year-old German schoolchildren interested in different nutrition aspects (multiple answers possible)

	Total	Boys	Girls
Exercise performance	61.0	73.8	50.0
Better learning	30.5	31.4	30.4
Weight loss	27.8	19.6	36.3
Healthy skin	26.1	19.0	34.8
Beauty	18.5	11.1	25.9
Illness	17.4	16.0	19.3
Environment	15.6	16.6	15.2
Allergies	11.1	10.0	12.6
Pollution	10.7	9.2	12.6
Other topic	3.3	3.0	3.7
No interest	7.3	9.2	5.2

Results of a survey of 551 schoolchildren aged 7–16 years in Hamburg, Germany. Children were permitted to make multiple answers and the values above (in %) reflect the number of children making each response.

majority of children in this age group expected adverse health effects from poor nutrition within half a year (fig. 5). While this may hold true for dental health or micronutrient deficiency, the nutritional impact on weight or chronic disease is pervasive over many years. This finding has been recently replicated in a representative sample of 12- to 17-year-old German adolescents [20]. In contrast to this, even 6- to 8-year-old children have more or less correct cognitive knowledge about healthy foods. When questioned about foods and health, more than 90% of 6- to 8-year-old children state that in order to stay healthy they should eat fruit and vegetables, and less than 40% think that fast food or coke and lemonade are good for their health [20]. However, it has been shown that knowledge about health or the fattening effects of food does not influence food or drink preferences in 6- to 10-year-old children [21].

Opportunities for Nutrition Education

In modifying the diet of children, involvement of the parents is crucial since they greatly influence the choice and availability of food in the home and the types of meals provided. Nevertheless, it may not be necessary to change attitudes of parents, since modifying the knowledge, attitudes and behaviour of children regarding their diet and activity patterns is liable to encourage changes in the whole family, including the parents and older or younger siblings [22].

An important aspect in nutrition education may be to focus on those aspects of nutrition which are considered important by the children themselves. The aforementioned survey of schoolchildren in Hamburg also explored the aspects of nutrition in which the participants were interested (table 3). Fortunately, only less then 10% confessed to having no interest in any nutrition topic. One clear finding was that abstract aspects of nutrition, e.g. disease, environment or pollution, attract little attention. However, there is great interest in those aspects of nutrition which have a direct and immediate perceivable benefit for the children. Nutrition and better exercise performance, nutrition and better learning (this is even more pronounced in younger children) and nutrition related to different aspects of beauty (this is more pronounced in girls than boys) all held great interest for the children surveyed.

Conclusions

In the light of the reviewed findings, a number of conclusions regarding future efforts in nutrition education may be drawn. Successful educational strategies should focus on providing a variety of foods, including the range of nutrient-dense 'healthy' foods and encouraging children to taste unfamiliar dishes. In addition, educational strategies should provide a stable and predictive pattern of social eating occasions to promote the social meaning and importance of eating and to enable social learning of food preferences. In addition, it appears to be more promising to establish rituals of meal preparation and eating than to provide cognitive knowledge in nutrition.

Educational strategies should communicate the direct perceivable benefits of healthy eating and lifestyle patterns to children, and encourage a positive body image by providing orientation and reassurance regarding *the range* of healthy and acceptable body weights and shapes. One important element in establishing healthy eating habits is the appropriate cognitive control of eating behaviour. Eating behaviour where there is no cognitive control to limit food intake seems to support the development of overweight and obesity, and their related adverse health consequences. This is becoming increasingly important in an environment that provides an abundance of foods and declining opportunities for physical activity during either play or school time. At the other extreme, rigid control of eating behaviour does not appear to help in the long-term management of body weight – on the contrary, it promotes the development of disordered eating patterns. It appears that flexible control of eating behaviour is the appropriate strategy to manage and survive our modern nutritional environment, and development of this should be the focus of educational strategies to engender lifelong healthy eating and body weight control.

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