CARBOHYDRATE NEWS

Current Issues in Child Nutrition

ROLE OF PARENTS IN DEVELOPING CHILDREN'S FOOD PREFERENCES AND EATING PATTERNS

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This article briefly considers the role of parents in the development of children's food preferences and eating patterns (see Benton[1] and Faith et al[2] for comprehensive reviews). Understanding the development of food preferences may contribute to improved strategies for establishing healthy eating patterns that will carry into adulthood and help prevent obesity.

There is a complex interaction between genetic and environmental factors that contributes to the development of food preferences. Studies examining facial expressions of infants show that there is an innate preference for sweet and salty and a dislike for bitter and sour tastes.[3] These preferences are influenced by genetic factors[4] and likely provide an evolutionary advantage because sweetness often predicts a source of energy, whereas bitterness predicts toxicity.

In general, the transition from childhood to adulthood is associated with a reduced preference for sweet items, lower sugar consumption and a diet of lower energy density.[5] Also with age, bitter tastes are more accepted and there tends to be a greater preference for vegetables and fruit. However, the taste of food is only one factor influencing food preferences in combination with visual, olfactory and tactile stimuli. Much research remains to facilitate further understanding of how genetic predispositions interact with dietary experiences and environmental factors to produce patterns of eating.

As innate preferences are modified by children's experiences, parents and other caregivers play a major role in influencing the development of children's food preferences and eating patterns. Some common parental approaches to encourage or discourage the consumption of certain foods may be effective, whereas others may have unintended consequences.

One common strategy used by parents to encourage the intake of certain foods and discourage the intake of others is to use one food (e.g., dessert) as a reward for eating a disliked food (e.g., vegetables). Unfortunately, several studies suggest that this strategy has the opposite effect of that intended, resulting in an increased preference for the foods used as a reward and a decreased preference for the disliked foods.[6,7] Similarly, if foods are given as rewards for desirable behaviour, the preference for those foods is enhanced.[8]

Most studies have found that children whose parents report greater control over the type and amount of food they consume are more likely to eat when they are not hungry, consume more energy, and be overweight relative to children whose parents allow them to regulate their own intake.[9]

In an attempt to prevent children from becoming overweight, well-intentioned parents may restrict their child's intake of highly palatable energy dense foods. This approach may be counterproductive as it appears to prevent children from learning how to respond to their own hunger and satiety signals and regulate energy intake. Most studies have found that children whose parents report greater control over the type and amount of food they consume are more likely to eat when they are not hungry, consume more energy, and be overweight relative to children whose parents allow them to regulate their own intake.[9] The resulting overweight may in turn lead to further parental restriction of children's eating, worsening the situation.[10] The effects seem to be more pronounced in younger children (under age 8), but are also observed in older children, particularly girls.[2] Although restricting foods may in the short-term decrease energy intake, in the longer term it will tend to cause a child to lose the ability to compensate for a high energy meal.

In contrast to restricting foods, providing a range of foods may allow a child to learn to select an appropriate amount of energy. If children have the opportunity to select from a range of foods varying in energy density within and across meals, over time they are able to adjust their energy intake either higher or lower to make up for missing energy or compensate for excess energy.[11]

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The emotional atmosphere of a meal is also important. In a positive atmosphere, the preference for foods eaten tends to increase, whereas the preference declines in a negative atmosphere. For example, parents who indicate that they like a food and involve children in its preparation create a positive atmosphere that encourages them to eat those foods. In contrast, parents who complain to a child about a food that is not eaten (e.g., vegetables) tend to create a negative atmosphere that leads to a decreased preference for that food.[12]

Parents and other caregivers play an important role in developing healthy eating behaviours in children, but can also contribute to the development of unhealthy patterns that lay the foundation for obesity (see below table). Because many common and seemingly sensible approaches may in fact be counterproductive, one strategy to help develop healthy eating patterns would be to educate parents about the key influences on food preferences. Research is needed to determine if such an approach would be effective.

ADVICE FOR ENCOURAGING HEALTHY EATING IN CHILDREN

- *Provide a positive atmosphere around meals. Do not use mealtimes to chastise or let a child's failure to eat cause unpleasantness.*
- *Siblings, peers and parents can act as role models to encourage the tasting of new foods.*
- *Children should be exposed to a range of foods, tastes and textures.*
- *Repeated exposure to initially disliked foods can breakdown resistance.*
- *Offering a range of foods varying in energy density allows children to balance energy intake.*
- *Restricting access to particular foods increases rather than decreases preference and consumption of those foods.*
- *Forcing a child to eat a food will decrease liking of that food. Neophobia (tendency to reject new foods) should be expected and should not generate negativity.*
- *Encourage children to be aware of hunger and satiety signals to allow these to define how much is eaten.*
- *Highly palatable foods should not be used as rewards or treats.*

Adapted from Benton.[1]

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ADDED SUGARS AND MICRONUTRIENT INTAKE: DOES IT MATTER?

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Sugars in foods are present naturally and added during food processing. Although the metabolism of naturally occurring and added sugars is the same, added sugars are often viewed negatively on the belief that they "displace" other nutrients including vitamins and minerals, especially in children. This perception is based on the fact that sugar is a pure carbohydrate that provides a source of energy but does not contain micronutrients. While this may be true, added sugars are usually consumed as part of foods that provide vitamins and minerals, as well as other nutrients including protein, fibre and fluids (e.g., yogurt, chocolate milk, breakfast cereals, and apple sauce). Thus, the relationship between intake of added sugars and intake of micronutrients is complex and not that obvious.

The Dietary Reference Intake (DRI) Report of the Panel on Macronutrients[1] presents an extensive review of the literature on added sugars intake. Of the seven large-scale surveys included in the review, the most consistent trend was no association or a minimal association between added sugars and micronutrient intake in those consuming less than 25% of energy as added sugars.[2-7] When intake of added sugars exceeded 25% of energy, intake of some micronutrients was reduced. For example, in a survey of 14,704 subjects aged two and older, no differences were found in intakes of 13 of 15 vitamins and minerals between subjects consuming an average of 6% or 14% of energy from added sugars, while those consuming an average of 27% of energy from added sugars had significantly lower intakes of vitamins and minerals.[6]

The impact of added sugars on micronutrient intake is similar in both children and adults. Analysis of the US National Health and Nutrition Examination Survey (NHANES III)[1] showed that intake of six micronutrients by children (4-8 and 9-13 years old) and adolescents (14-18 years old) of both sexes generally did not differ between those consuming low or high intakes of added sugars. However, when intakes of added sugars were above 25% of energy, intakes of some micronutrients in some age-sex subgroups tended to be lower. Interestingly, intake of several nutrients was highest in those consuming medium rather than low amounts of added sugars. For example, in 14-18 year-old males, the highest intake of iron, zinc, and vitamins A and E, was in those consuming 15-20% of energy from added sugars. Again, because added sugars are not usually consumed in isolation, adopting a dietary pattern that restricts intake of added sugars may also exclude a wide range of foods that are important sources of micronutrients.

In view of the complex relationship between added sugars and micronutrient intake, the DRI macronutrient panel concluded that the evidence did not support setting a Tolerable Upper Intake Level for added sugars intake. They also noted that the low intake of micronutrients with both very low and high intakes of added sugars may be secondary to atypical eating habits. Nevertheless, the DRI panel suggested that added sugars should not exceed 25% of energy based on the decreased intake of some micronutrients by subpopulations of Americans who exceeded this level. To put this in perspective, the average intake of added sugars is about 16% of energy in the US[8] and 13% in Canada.[9,10]

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The analysis of dietary intake in the DRI Report examined the relationship between micronutrient intake and percent of energy from added sugars using a ratio approach. Because percent of energy from added sugars depends on both energy from added sugars and total energy, it is impossible to determine if an observed association is truly caused by added sugars or by other sources of energy in the diet. An alternative statistical analysis to that used in the DRI report was recently conducted wherein energy intake from all sources was "deconstructed" to examine the effect of *energy from added sugars and energy from all other sources*.[11] Using the same NHANES III data set as the DRI report, this analytical approach showed that the association between added sugars and micronutrient intake was inconsistent showing either a small positive or negative relationship or no relationship depending on the age-gender group. In contrast, energy from other sources had a strong and consistent positive association with every micronutrient in every population group. Generally, the relation for *energy from added sugars* (whether positive or negative) was one-tenth to one-fifth the size of the relation for *energy from other sources*.

For optimum diet quality, consumers should focus on consuming a balanced and varied diet. For example, when using the energy deconstruction approach to predict calcium intake of 14-18 year-old females, moving from the 10th to the 90th percentile of *energy from other sources* increased calcium intake by 845 mg/day whereas the same shift for *energy from added sugars* decreased consumption by 6 mg/day, a difference that is not biologically significant.[11] The pattern for males was similar but the predicted values of calcium consumption were higher. This suggests that food sources of a given nutrient, not added sugars intake, have the greatest effect on diet quality.

In conclusion, limited evidence suggests that intakes of added sugars in excess of 25% of energy are associated with lower intakes of some micronutrients in some subpopulations, but even at this level, the effect may be due more to intake of total energy, and the types of food consumed, rather than the amount of added sugars. Average intakes of all added sugars in Canada are estimated to be about 13% of energy,[9,10] within the range consistent with adequate micronutrient intakes.

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DOES EARLY EXPOSURE TO SWEET TASTES HEIGHTEN PREFERENCE FOR SWEET FOODS?

There is a common belief that providing sweet tasting foods to children will result in an increase in their future preference for sweet foods, or the development of a "sweet tooth". As a result, some believe that they should restrict sweet tasting foods in children.[1] Research on this issue, however, suggests that this belief may be unfounded.

As noted above, infants and children have a strong and innate preference for sweet tastes, but this preference decreases in adolescents and adults.[2] It is believed that this decline in sweet preference is at least partly innately determined.[3] Practically, this means that foods perceived as optimally sweet by children will often be perceived as too sweet by adults.

Consistent with evidence that parental restriction of foods leads to increased preference for those foods,[4] restricting sweet tasting foods appears to lead to increased, rather than decreased, preference for sweet tastes. In one study, children of parents who restricted sweet foods consumed fewer sweet foods over the short term, but had an enhanced preference for sweet tastes.[5] Children ranked their preference for five orange-flavoured beverages that varied in sugar content and their parents completed questionnaires assessing their rules concerning their children's consumption of sugar-containing foods. The researchers found that children in the high-restriction group preferred sweeter beverages (55% preferred the sweetest and none preferred the least sweet beverage) than those in the low-restriction group (33% preferred the sweetest and 19% preferred the least sweet beverage). The authors concluded that restricting sweet foods may result in decreased intake of those foods over the short term, but may increase consumption in situations where parents are unable to control their children's consumption.

Interestingly, regardless of preference for sweet foods, this trait does not appear to affect body weight as most studies show no difference in preference for sweet tastes between obese and non-obese adults.[4]

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RESEARCH UPDATE

ACKNOWLEDGEMENTS

Gérald Fortier for the French translation; Dr. Nathalie Jobin for her review of the French translation.

Publié en français sous le titre : « Glucides-Info »

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EFFECTS OF DIET ON BEHAVIOUR AND COGNITION IN CHILDREN

Bellisle F. British Journal of Nutrition 2004; 92:S227-32

Diet can affect cognitive ability and behaviour in children and adolescents. Nutrient composition and meal pattern can exert immediate or long-term, beneficial or adverse effects. Beneficial effects mainly result from the correction of poor nutritional status. For example, thiamin treatment reverses aggressiveness in thiamin-deficient adolescents. Deleterious behavioural effects have been suggested; for example, sucrose and additives were once suspected to induce hyperactivity, but these effects have not been confirmed by rigorous investigations. In spite of potent biological mechanisms that protect brain activity from disruption, some cognitive functions appear sensitive to short-term variations of fuel (glucose) availability in certain brain areas. A glucose load, for example, acutely facilitates mental performance, particularly on demanding, long-duration tasks. The mechanism of this often described effect is not entirely clear. One aspect of diet that has elicited much research in young people is the intake/omission of breakfast. This has obvious relevance to school performance. While effects are inconsistent in well-nourished children, breakfast omission deteriorates mental performance in malnourished children. Even intelligence scores can be improved by micronutrient supplementation in children and adolescents with very poor dietary status.

Overall, the literature suggests that good regular dietary habits are the best way to ensure optimal mental and behavioural performance at all times. Then, it remains controversial whether additional benefit can be gained from acute dietary manipulations. In contrast, children and adolescents with poor nutritional status are exposed to alterations of mental and/or behavioural functions that can be corrected, to a certain extent, by dietary measures.