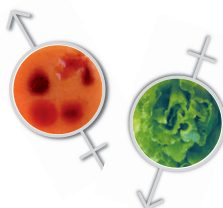


“FRUIT & VEGETABLES:



CHILDREN PREFERENCES”

## Editorial

The first article in this edition of the newsletter explores the widely replicated, but poorly understood finding of sex differences in children's consumption of fruit and vegetables (FV). Using data from the Fruit and Vegetables Make the Marks study, Elling Bere and colleagues identified greater preference for, and perceived availability of FV as the principal determinants of girls' higher intake.

There are also age differences in children's responses to food and our second article describes qualitative research into the relationship between children's cognitive development and their food preferences and perceptions (Zeinstra et al). The authors found that younger children were more concerned with the texture and appearance of food whereas older children were more influenced by taste. They further report that children of all ages were largely impervious to appeals to eat “healthily”.

Finally Privitera reports on research into the efficacy of ‘flavour-reinforcement’ learning in increasing liking. Not only were children's preferences increased when foods were sweetened but effects persisted long after sweetening ceased.

Together, the articles in the current issue highlight some factors to consider when devising interventions – that boys are predisposed to like FV less than girls (Bere) that influences on food likes and dislikes differ with age (Zeinstra et al) and that an effective practical strategy for increasing liking for FV may be to add sweeteners (Zeinstra). Since children's FV intake still falls well below recommended levels in most countries, these research findings are important and timely.

Lucy Cooke,

CR-UK Health Behaviour Unit, University College, London

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# Why do boys eat less F&V than girls?

— Elling Bere —

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Today, in Western countries men die earlier than women. Men also eat less healthfully than women, e.g. they eat less fruits and vegetables (F&V). Boys also eat less F&V than girls. However, sex is not (at least not easily) changeable, and for intervention development it is important to identify modifiable determinants for the sex disparity. In a recent article, we wanted to explore why boys eat less F&V than girls<sup>1</sup>.

Only a few studies in adults have assessed this question. Suggested determinants (or reasons) for the sex disparity among adults are that men have poorer nutritional knowledge, less interest in health in general, and dieting status (women are more often dieting). In earlier Norwegian studies, a number of personal modifiable determinants of adolescents' F&V intake have been identified, including perceived accessibility of F&V at home, modelling, intention to eat 5-a-day, preferences for F&V, self-efficacy to eat 5-a-day and knowledge of recommended intake levels. In the present study, using data from the Fruits and Vegetables Make the Marks (FVMM) project, these factors were analysed as potential mediators of the sex disparity in adolescents' F&V intake.

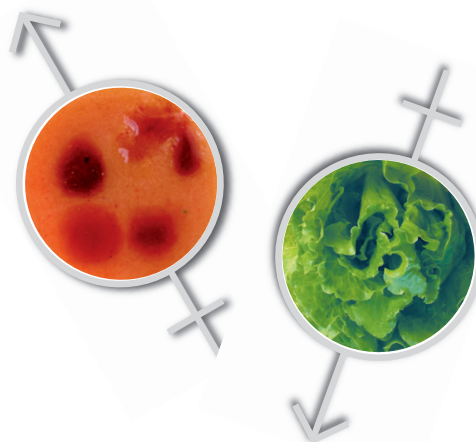
In the study sample boys clearly ate less F&V than girls: 11.9 and 14.5 times/week, respectively. Boys also scored lower on all the potential determinants (e.g. boys had less knowledge about the national F&V recommendation). The sex difference in the potential determinants explained 91% of the sex difference in F&V intake. One factor explained more than all the other together: preferences. In addition, perceived accessibility also uniquely explained some of the sex disparity. In summary, this study indicates that Norwegian boys eat less F&V than girls because they like them less, and also in part, because they don't find them as accessible at home as girls find them to be. The sex disparity in adolescents' F&V intake does not appear to be explained by girls' role models greater

knowledge, stronger intentions and self-efficacy.

It has previously been reported that boys like F&V less than girls. Even among four year olds, girls have been reported to like vegetables better than boys. However, the question why boys like F&V less than girls remains unanswered. It has been suggested that social desirability may have a stronger impact on girls' responding to the questionnaire because of the greater importance that females attach to diet. A second reason might be that boys' greater liking for more energy dense foods (i.e. not F&V) serves as an adaptive purpose for their greater energy requirement. This hypothesis points towards physiological differences between boys and girls. Could it be that boys like F&V less than girls mainly because boys and girls physiologically are different? In traditional hunter-gatherer societies, men were hunters and women were gatherers. Even if the food were divided between the sexes, men probably ate more hunted animal food and women probably ate more gathered plants. The result might be that a difference in food preferences between males and females evolved. However, this is a hypothesis that needs to be tested.

We also observed a sex difference in perceived accessibility of F&V at home, and girls scored higher than boys. However, parents within the FVMM cohort do not report the accessibility of F&V at home to be different for boys or girls. The sex difference must therefore be due to how the adolescents perceive the accessibility and not to the accessibility at home itself. Therefore part of the sex difference in F&V intake is due to the fact that girls perceive the accessibility at home to be higher, even if it probably is not true.

In conclusion, this study indicates that the main reason why boys eat less F&V than girls is because they like them less. An important next research step will be to assess why girls like F&V more than boys



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# Cognitive development and children's perceptions of fruit and vegetables



— Gertrude G Zeinstra<sup>1</sup>, Maria A Koelen<sup>2</sup>, Frans J Kok<sup>1</sup>, Cees de Graaf<sup>1</sup>—

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Despite the positive health effects, children's fruit and vegetable consumption is below the recommendations<sup>(1,2)</sup>. Intervention studies have shown that their fruit and vegetable consumption can be increased successfully. Increases in intake have been found to range between 0 - 2.5 servings a day. However, most of the changes are due to increased fruit consumption, and long-term changes have rarely been seen<sup>(3-5)</sup>. Therefore, it is important to focus on new approaches. Since preference is the most important determinant of children's food intake<sup>(6-8)</sup>, we should aim to increase children's preference for fruit and vegetables. In line with the Ottawa Charter, we should aim for "Make the healthy choice, the tasty choice!". In the area of food preferences, cognitive development has almost never been taken into account.

Developmental theories show that when children grow up, their cognitive abilities increase: concrete thinking becomes more abstract and logical; information processing becomes more advanced and strategic; centration and egocentrism diminishes; and children's capacity to employ mental operations and hypothetical thinking increases<sup>(9, 10)</sup>. Since children in distinct cognitive stages think, perceive and understand food topics differently, they may need different approaches to change their food preferences.

In our qualitative study, we investigated how cognitive development is related to children's food preferences and perceptions. Focus group discussions and duo-interviews were held with children in three age groups: 4-5-years-old, 7-8-years-old and 11-12-years-old. Different topics were discussed and several fruits were tasted (see<sup>(11)</sup> for details).

It was found that the preferences of children from the three age groups were influenced by different attributes. Young children focused more on appearance and texture, whereas older children focused more on taste. This finding is in line with Rose et al<sup>(12)</sup>. Older children were also more specific about the way the food was prepared, which may indicate that young children may dislike

spinach in any form, whereas older children can dislike cooked spinach but like it in an oven dish.

We also found that young children have difficulties in explaining what health means. This concept is too abstract for them, and needs the capacity of long-term thinking. Contrary to the finding that most children link the concept of "healthy foods" with "not tasty"<sup>(13, 14)</sup>, we found that this link was not present in 4-5-year old children. So probably, this link between "healthy" and "not-tasty" develops somehow before the age of 7-8 years.

Another important finding was that parents used different healthy-eating strategies in the three age groups, which were in line with children's cognitive developmental capacities. Also, the emergence of social norms and others' perspective as children grow up was seen in children's reasoning about fruit and vegetables.

Taking these findings into account, we would suggest the following actions which can be helpful to encourage children's fruit and vegetable consumption:

- Do not use the strategy "You should eat your veggies/ fruit, because it is healthy". Young children do not know what is meant by "healthy" and older children may have developed a link between "healthy" and "distaste".
- Be aware that texture and appearance may be more important in younger children. So, finding out which texture and appearance is most attractive to your own child with regard to fruit or vegetables, and preparing it in this way, can increase children's willingness to taste, and their intake.

In conclusion, it appears that cognitive development plays a role in children's perceptions of, and preferences for fruit and vegetables. To be effective on the long-term, we should include these developmental aspects in interventions aiming to increase children's fruit and vegetable intake.

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# Decreasing dislike for sour and bitter in children and adults

— Gregory J. Privitera —

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Increasing children's consumption of fruits and vegetables can be challenging for many parents. It doesn't help that parents often use failed strategies. For example, many parents report giving their children a dessert to reward eating healthy food options in a meal, although only 7% of parents report that this strategy actually increases liking for that food. Some parents resort to forcing their children to consume healthier foods in a meal, often by having their children sit at a table until they have "cleaned their plates." This also produces a negative outcome; children generally report greater dislike for foods they are forced to consume. This article focuses on an alternative learning strategy that parents can use to increase consumption of fruits and vegetables: flavor-reinforcement learning. This method not only works, but is also a practical strategy for parents.

## ***Increasing Liking By Making Foods Taste Good!***

Why won't some children and adults eat fruits and vegetables? One reason is that some fruits are sour (e.g., grapefruit) and most vegetables taste bitter. Children and adults must learn to like these tastes since at birth, human infants reject bitter and sour tastes. One method parents can use to increase liking for the taste of fruits and vegetables is to make them taste better by mixing these foods with already liked tastes (such as sweeteners) or with nutrients. However, many of the substances that make foods flavorful not only taste good, but they also provide calories. So for the purposes of this article, I will not distinguish between making foods taste good and making them nutritious. Both methods have been shown to independently increase liking in animals and humans.

In one recent study, we noticed that some children (two to five years old) did not like the taste of sour grapefruit juice, as measured in a baseline phase. To increase liking for the sour-tasting juice, we gave children sweetened grapefruit juice over the next twenty days (conditioning phase). After conditioning, children again received the plain (unsweetened) grapefruit juice (testing phase). This test showed that children who initially disliked the juice expressed greater preference for the sour taste compared with baseline measures of liking for grapefruit juice. This increase was persistent weeks later in a follow-up test where

children reported still liking the unsweetened, sour-tasting juice.

A similar result was shown using vegetables in adults. Undergraduate students received broccoli and cauliflower mixed with sugar on two occasions. Some college students received sweetened broccoli and unsweetened cauliflower; others received sweetened cauliflower and unsweetened broccoli. When later tested with unsweetened broccoli and cauliflower, students rated as more pleasant the vegetable that was given to them earlier as sweetened, as opposed to the vegetable given to them earlier as unsweetened. Similar to the results using grapefruit juice, this study showed that making vegetables more palatable (by sweetening them) decreased dislike for them.

## ***A Short-term Method With Long-Term Results?***

Despite the effectiveness of this learning strategy, only about one-third of parents report that they use this method to shift children's food preferences<sup>1</sup>. One concern for parents may be with the use of sugars and sweeteners to increase liking. If this is a concern, parents should be aware of two distinct features for this method of learning:

First, the sweeteners do not need to contain calories; they simply need to taste sweet. It is likely that non-caloric sweeteners, such as Equal sweetener, would also effectively increase preferences for these fruit juices and vegetables.

Second, preferences are thought to shift permanently without further training. Based on our work, sweetening foods for only a few weeks can cause permanent shifts in liking, even after the sweetener is no longer added. In fact, it has been shown that flavors that were once sweetened continue to be perceived as "tasting" sweet even without being sweetened anymore! This is one potential explanation for why the children in our study continued to like the sour tasting fruit juice weeks later.

At present we can determine that sweetening fruits and vegetables for a short while is an effective strategy to decrease dislike for these foods in children and adults. Also, while further empirical support is needed, a growing literature supports the view that these shifts in liking are long-lasting.

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