



Research report

From the Garden of Eden to the land of plenty Restriction of fruit and sweets intake leads to increased fruit and sweets consumption in children

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ABSTRACT

Overweight is increasing rapidly in children, compelling researchers to seek for determinants of adverse food intake. In a previous experiment it was found that manipulating the restriction of attractive snacks increased the desirability and intake of these snacks. In the present study, we tested whether this paradoxical restricting effect is also seen in relatively less attractive but healthy food, i.e. fruit. Will fruit become more desirable through restriction, and will children eat more forbidden fruit than non-forbidden fruit?

Two groups of young children were forbidden to eat fruits and sweets, respectively, whereas a control group was invited to eat everything. Desire for sweets remained high in the sweets-prohibition condition, whereas it decreased in the fruit-prohibition and no-prohibition conditions. No group differences were found regarding the desire for fruit. With respect to intake, children in both the fruit- and the sweets-prohibition condition consumed more of the formerly forbidden food during a taste session as compared to the no-prohibition condition. In addition, total food intake was higher in the two prohibition conditions than in the no-prohibition condition. These data indicate that the adverse effects of restriction apply to both attractive unhealthy and relatively less attractive but healthy food.

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Introduction

Overweight and obesity are becoming alarmingly prevalent in the Western society. In the Netherlands, 46% of all adults are overweight (Body Mass Index (BMI) > 25 kg/m²; CBS, 2006), whereas over 10% are obese (BMI > 30 kg/m²; CBS, 2006). In the United States, the figures are even more shocking: one in every three adults is obese (Ogden et al., 2006). Also, overweight and obesity in children have increased to exceptional proportions. At present, one out of seven Dutch children is overweight (van den Hurk et al., 2006). In the United States, about 17% of all children and adolescents are overweight, whereas an additional 16.5% are at risk of becoming overweight (Ogden et al., 2006). Obesity is diagnosed in 3% of Dutch children. As childhood overweight generally tracks into adulthood (Clarke & Lauer, 1993; Serdula et al., 1993; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997), it is of major significance to challenge overweight early in life.

In general, obesity is caused by an imbalance between the intake and the expenditure of energy (Wabitsch, 2000). Current

food patterns do not only show substantial increases in snack intake compared to 25 years ago (St-Onge, Keller, & Heymsfield, 2003), they also indicate that children do not consume enough fruit and vegetables. Even though the Dutch National Food Council recommends that children eat at least two portions of fruit a day (Health-Council-of-the-Netherlands, 2002), Dutch children eat less than one portion of fruit (Dutch Food Consumption Survey, 1998). As fruit consumption protects against overweight (McCrary et al., 1999), increasing fruit intake is just as important as decreasing the intake of unhealthy kinds of food.

Parents leave their mark on the development of their children's weight status (see e.g. Birch & Fisher, 1995). They have an important role in stimulating healthy eating behaviour in their children and parental modelling has a consistent influence on the child's eating behaviour (Brown & Ogden, 2004). It was, for example, found that children imitate their parents in both food preferences and food avoidances (Guidetti & Cavazza, 2008). Considering all of this, it seems obvious to keep children away from certain unhealthy kinds of food, and to encourage them to eat healthy food. In addition to being role models for their children and being in charge of purchasing and providing meals, parents may also influence their children's eating patterns by using control techniques. According to Birch et al. (2001) parental control in the

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domain of eating can be subdivided into pressuring the child to eat healthy kinds of food (e.g. fruit and vegetables) and restricting intake of unhealthy, palatable (fatty or sweet) kinds of food. Overcontrolling a child's food intake potentially leads to adverse effects on food preference and intake. It has been hypothesized that parents overcontrolling their children's food intake may interfere with their children's ability to self-regulate their intake. As a result, children would be more responsive to external cues (e.g. the smell and presence of foods) as opposed to internal cues (e.g. hunger and satiety) (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Jansen et al., 2003). In turn, this could lead to disturbed eating behaviours like eating in the absence of hunger, restrained eating and ultimately excess weight gain (Birch & Fisher, 2000; Birch, Fisher, & Krahnstoeber Davison, 2003; Robinson, Kiernan, Matheson, & Haydel, 2001).

Researchers have found pressuring to eat healthy kinds of food to be associated with lower fruit and vegetable consumption and picky eating in children (Galloway, Fiorito, Lee, & Birch, 2005). In an experimental design examining the influence of pressure to eat, Galloway, Fiorito, Francis, and Birch (2006) found that normal weight children consumed more soup and made fewer negative comments when they were *not* pressured to eat. Thus, pressuring children to eat indeed appears to result in adverse consequences.

Evidence for the potential negative effects of restriction is largely correlational. Several researchers have found parents' restrictive behaviour to be associated with their children's weight status: the more restriction of food intake, the higher the weight (Birch et al., 2003; Constanzo & Woody, 1984). Although it might seem plausible that restriction by parents could result in disturbed eating behaviour, the alternative could be that parents start restricting the intake of palatable kinds of food as they observe their children becoming heavier. This problem of causality can be solved by manipulating restriction behaviour in an experimental setting. Past research in rats has shown that, even without depriving energy, restricting access to alcohol (Wayner et al., 1972) or an optional high-fat food (Corwin et al., 1998) leads to significant increases in the consumption of the restricted substance when it is subsequently made available. Fisher and Birch (1999) studied the influence of restriction of palatable foods in children. In this study, children participated in eight group snack sessions: four unrestricted sessions, followed by four restricted sessions. The target food was a palatable snack food. The alternative was a food of lower preference. During the unrestricted sessions, both types of food were freely accessible during 15 min. During the restricted sessions, children had only one 5 min period of free access to the restricted food. The results showed that children's behavioural response (requests for the food, attempts to obtain it or comments about liking it) to the palatable snack food was greater during restricted sessions than during unrestricted sessions (Fisher & Birch, 1999).

Jansen, Mulkens, and Jansen (2007) also studied the influence of restriction in children. It was tested whether a prohibition of attractive snacks would lead to an increased desire for that food

and overeating at a later moment in time. Children in the experimental group were not allowed to eat red M&M's and red crisps in the first phase of the experiment (but were allowed to eat the yellow versions of these same snacks), whereas children in the control group were allowed to eat from both red and yellow snacks in the first phase. The second phase of the experiment was an 'all you can eat' phase for both groups. Desire for and intake of red food increased in the experimental group, whereas desire and intake of red foods remained constant in the control group. From this study it was concluded that restricting the intake of attractive snacks in children actually has adverse effects on food preference and intake. Moreover, it was found that parental restriction, measured among parents with the restriction scale of the Child Feeding Questionnaire (CFQ; Birch et al., 2001), was associated with snack intake during the taste sessions. Both children of parents reporting either low or high levels of restriction consumed significantly more snacks during the experiment than children of parents reporting a moderate level of restriction.

As restricting the intake of attractive snacks increases the desirability of these snacks (Jansen et al., 2007), it would be useful to examine whether it is also possible to make relatively less attractive kinds of food (e.g. fruit) more desirable by the use of restriction. Therefore, the current study focuses on the effects of restriction of both attractive and less attractive food. In this study we test whether prohibiting either sweets or fruit will result in an increased desire for the forbidden food followed by an increased consumption. Desire for and consumption of the forbidden food is expected to increase after prohibition, regardless of which type of food is forbidden. Further, it is hypothesized that the degree of restriction at home will be associated with overall energy intake during the experiment: the more a child is restricted at home, the more it is expected to consume during the taste sessions.

Method

Participants

Seventy children were recruited from two primary schools in the Netherlands. Participants were told that the experimenter was interested in what kind of tastes children like. The participating children were 5–7 year olds (mean age = 5.57, S.D. = 0.55). In this age group, minimal social desirable behaviour concerning eating was expected. Older children, or adolescents, could possibly experience feelings of shame and guilt to a greater extent than younger children. In addition, children in this age category are able to obey prohibitions (Piaget, 1965). Permission for participation was obtained from the participating schools as well as from the children's parents. Parents were requested not to share information concerning the content of the study with their children. The study was approved by the ethical committee of the Faculty of Psychology, Maastricht University. Cooperating schools received a gift certificate afterwards. Participant characteristics are summarized in Table 1.

Table 1
Age, gender and BMI characteristics of the three conditions

	No-prohibition condition		Fruit-prohibition condition		Sweets-prohibition condition		F value	P value
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
N	22		25		23			
Age	5.36	0.49	5.72	0.54	5.61	0.58	2.62	NS
Gender (boy/girl)	13/9		16/9		14/9		0.06	NS
BMI percentile	77.15	20.95	60.11	26.28	81.36	23.67	5.38	<0.01

One-way ANOVAs showed no significant differences between conditions regarding age and gender distribution. However, groups differed significantly regarding BMI (Body Mass Index) percentile.

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