The way to healthy eating for children

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The way to healthy eating for children

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There is widespread concern that children consume too few fruit and vegetables and as a result are likely to incur health problems. This paper outlines a series of studies in which an intervention that combines video-based peer modelling with rewards has been shown to be very effective in enabling children to eat a variety of fruit and vegetables that previously they rejected. These effects, have been very substantial and long lasting. The procedure has been used successfully in children's own homes and, as this paper shows in particular detail, in school settings.

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British Food Journal
100/3 [1998] 133–140

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Introduction

The evidence that eating fruit and vegetables has major health benefits is now well established (Gillman, 1996; Key *et al.*, 1996). Many children, however, have very restricted diets and fail to eat even the minimum recommended levels of these foods (Heimendinger and Van Duyn, 1995; Walker, 1995). The problem is well known but, until now, solutions have proved elusive. Because there are so many powerful forces directed at children encouraging them to eat diets that are not nutritious, effective counter influences are desperately needed. Health education campaigns have been waged to change "attitudes" and much information has been disseminated on the health-giving properties of fruit and vegetables, but such strategies are of little avail if, as often happens, children's actual consumption of these foods remains unaltered (Gatherer *et al.*, 1979). Children, like adults, may know one thing but do another. The alternative approach, adopted in the present research, is to focus therefore on what children actually eat and, particularly, how they can come to enjoy a variety of fruit and vegetables. To achieve this we have devised techniques that include the provision of positive messages about fruit and vegetables, as well as direct incentives to taste them. Our work indicates that, using such techniques, it is not difficult to bring about long-lasting and, in health terms, highly beneficial changes in children's food choice. We maintain, however, that such efforts must be founded upon a good understanding of the psychological principles governing child behaviour in general and food choice in particular.

In the present paper we briefly outline some of the psychological factors involved in children's food preferences. We then describe our experimental research. Our studies have been conducted in children's own homes, schools and, in the case of two to four year-old children, in a day-care nursery. Our findings from studies conducted with five to seven year-old individual children in their homes have been outlined elsewhere (Horne *et al.*, 1995; Lowe *et al.*, in press) and will be reviewed only briefly in this paper, most of which is devoted to a summary of our recent work conducted with whole classes of five to seven year-olds in local schools.

Our theoretical perspective

Our theoretical position combines the findings of contemporary work on learning and cognitive processes (Catania, 1992; Horne and Lowe, 1996, 1997; Lowe, 1983) with the socio-cultural insights of Vygotsky (1987) and Mead (1934). In our view, the convergence in humans of classical and operant conditioning processes with the acquisition of language, including the ability to respond to and use names, verbal propositions and rules, exerts a pervasive influence on human behaviour. In the context of food choice, for instance, we maintain that once they are verbally adept, children no longer react to foods merely as particular objects with inherent qualities of taste, smell, appearance, etc., but respond to them as named classes of items and respond to the verbalisations that they themselves and others make about those named classes. For example, after hearing an admired friend express a dislike of vegetables ("I hate vegetables; vegetables are horrible"), a child may afterwards also adopt this view and assert that "vegetables are horrible", and consequently come to identify him/herself as someone else who "does not like vegetables". Parents and others may then also, as a consequence, come to believe that the child "does not like vegetables" and respond accordingly.

In contrast, our programme sought to harness positive verbal conceptualisations to overcome obstacles in the way of children's tasting fruit and vegetables and learning to like them. One way of achieving this is to provide opportunities for children to see and

British Food Journal
100/3 [1998] 133–140

hear others react positively to these foods. In addition, if children can be brought to repeatedly eat those foods and there are no negative consequences attendant upon that consumption, their conceptions of themselves as individuals who "eat" or "like" fruit and vegetables alter accordingly. With repeated tastings also, the taste of those foods may come to be increasingly discriminated and liked (or, at least, not disliked); a number of studies have shown that repeated tastings of a food enhances preference for that food (Birch and Marlin, 1982; Birch *et al.*, 1987; Pliner, 1982). The key practical issue then was how to circumvent negative conceptualisations about food and achieve repeated tasting. To this end we developed an intervention that utilised two variables already known to be powerful influences on human behaviour in general: peer modelling and rewards.

Peer modelling

There is an extensive psychological literature which shows that observational learning or "peer modelling" can have powerful effects on behaviour, particularly when:

- the models are perceived by the observer to be similar to him/her (Bandura, 1977);
- the models are of similar age or slightly older than the observer (Brody and Stoneman, 1981);
- the model's behaviour is rewarded (Bandura, 1977; Deguchi, 1984); and
- the observer's imitation of the model is rewarded (Bandura, 1989, and see Baer and Deguchi, 1985 and Gewirtz and Stingle, 1968).

Rewards

There is likewise a substantial body of research, carried out in both applied and experimental settings, that testifies to the general effectiveness of contingent rewards in altering behaviour (Bellack *et al.* 1985; Skinner, 1969). Although, in the food preference literature in psychology there is some confusion about the effects of rewards (for reviews, see Dowey, 1996; Lowe *et al.*, in press), it seems clear that, when used appropriately, rewards can be a highly effective component of procedures employed to alter children's preferences. The evidence indicates that if they are to be effective, rewards:

- are best presented in the context of "real-life" settings;
- should be potent (i.e. they should be something that the children really want);
- should be delivered contingent upon performance of the desired behaviour (i.e. upon actual consumption of the targeted food but not otherwise);
- should be clearly specified as to what they are and how they can be earned (i.e. "if you eat x, then you will get y") in instructions given to the children; and, most importantly,
- should be delivered in an appropriate context (i.e., that conveys not that they are compensations for low-value, disliked options, but rather that they are for behaviour that is high status and enjoyable – see Lowe *et al.*, in press).

A video-based peer modelling and reward intervention

We incorporated these research findings in the design of our video-based peer modelling and reward intervention which, with minor variations, is the intervention employed in all the studies described here. Children participating in our studies are explicitly taught to name and categorise a range of fruit and vegetables and their consumption of these items is recorded over several days. They are then exposed to our "Food Dude" video in which the scenario is of a group of slightly older children (the Food Dudes) eating, enjoying and extolling the virtues of a variety of named fruit and vegetables, and encouraging child viewers to do likewise. The Food Dudes ask the children to help them in their fight against General Junk and his evil junk food junta by eating fruit and vegetables to stay healthy and to keep the life force strong. A range of Food Dude prizes (e.g. fruit/veg eater stickers and badges, lunch boxes, baseball caps) are awarded to those children who consume sufficient quantities of targeted foods, and the Food Dudes also send daily letters to participants in which they provide instructions, feedback and encouragement.

Home studies

The effectiveness of this intervention was first assessed in a series of studies conducted in children's own homes (for details, see Lowe *et al.*, in press). The setting chosen was the family evening meal which included fruit and vegetables previously consistently rejected by the child. In some of the studies, the Food Dudes referred to the "targeted" foods using specific labels (e.g. "guava", "broccoli"), in others they referred to them more generically (i.e. "fruit", "vegetables"). A multiple baseline research design was adopted in this and all other studies reported here (Kazdin, 1982); children's levels of consumption of the fruit and vegetables to which they were exposed were recorded in the first baseline (i.e. prior to the introduction of the intervention),

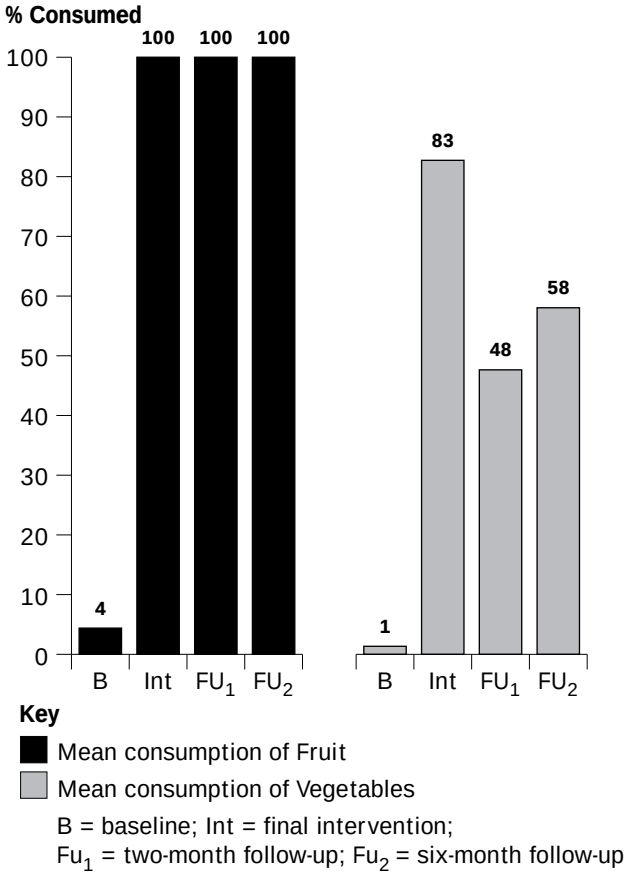
British Food Journal
100/3 [1998] 133–140

during the intervention phase/s, immediately after the intervention had been withdrawn (second baseline), and then again some months after the main study had finished (follow-ups). In accordance with guidance given by the investigators, the parents monitored consumption levels and supervised allocation of appropriate rewards; the children also monitored their own performance during interventions.

In those studies where the Food Dudes named specific fruit and vegetables that the children should eat, there were large increases in the consumption of those specific foods. However, it was following the intervention in which the Food Dudes encouraged the children to eat, not just specifically named items but the more general categories of food, "fruit" and "vegetables", that the largest overall increases were recorded. Figure 1 gives the results of one of the studies that employed this "general category" instruction (Lowe *et al.*, in press, Experiment 2). This shows that, for the four five to seven year-old children who participated, consumption of fruit and vegetables was extremely low (i.e. 4 per cent and 1 per cent, respectively) over the several days of the first baseline phase (i.e. minimum of 12 days), but after introduction of the intervention, their consumption of targeted fruit and vegetables rose to 100 per cent and 83 per cent, respectively. The children were observed again after two months, and then after six months when their consumption levels were still 100 per cent of the fruit and 58 per cent of the vegetables. In addition, there was clear evidence that the use of the "general category" instructions had caused these effects to "generalise" to other foods that shared the generic "fruit" or "vegetable" labels (see Lowe *et al.*, in press). This finding suggested the interesting possibility that even if it featured only small numbers of examples of fruit and vegetables, the intervention could, if those examples were given a general category label, effect wide-ranging changes across diets as a whole.

Having established that the intervention could succeed in producing large effects that both were maintained over time and generalised to other non-targeted foods, we then carried out further studies to ascertain whether one component of that intervention (either the peer modelling or the rewards) might be sufficient on its own to bring about such effects. In the event, our studies suggested that the effects of the peer modelling video without the rewards were minimal. There were some effects when rewards were used without the video (especially with fruit), but these were not as great as when video and rewards were combined. The effects of the combined package thus proved to be greater than the sum of its parts, each component potentiating the other when both were used in concert (and see Lowe *et al.*, in press).

Figure 1
Summary data for a group of four children from a study that employed the video-based peer modelling and reward intervention in children's homes



School studies

The home studies showed large effects but each was carried out with only small numbers of children. To be of real practical use to agencies with an interest in improving children's diets, our intervention would have to prove that it was also capable of effecting big increases in the fruit and vegetable consumption of large groups of children and, moreover, would have to show itself to be cost effective. Accordingly, we set about investigating whether our intervention could be effectively adapted for implementation with large numbers of children in school settings.

School study 1

The nutritional quality of children's diets depends, of course, as much on what they do usually eat as on what they do not. For

British Food Journal
100/3 [1998] 133–140

example, many of them habitually eat snack foods that are high in fat and sugar, whilst at the same time failing to eat sufficient fruit and vegetables. Whether our intervention could prove potent enough to increase children's consumption of fruit and vegetables even in the face of a competing availability of popular sweet and savoury snacks was another important factor we put to the test in this study.

Participants and procedure

The participants were a class of 26 children of five to six years of age, in a North Wales primary school. Experimental sessions took place during the mid-morning snack period over 30 consecutive school days. At the outset, children were randomly divided into three groups ("teams") who ate together at snack-times for the duration of the study. The 24 different foods used as snacks were: six fruits (e.g. kiwi, cherries), that were a mixture of fresh, dried and bottled; six vegetables (e.g. carrots, red cabbage), all served raw; six sweet snacks (e.g. chocolate buttons, Mini-Jaffas); and six savoury snacks (e.g. Hula-Hoops, Monster Munch). Each day the children were asked to indicate which four of eight foods (two fruit, two vegetables, two sweet snacks, two savoury snacks) they intended to eat during the snack period. At snack-time they were each presented with a tray of the eight foods and asked to choose four, which they were then given. Records were kept of the children's statements of what they intended to eat, their choices, and the quantities of foods they actually consumed. The initial baseline period lasted 12 days during which each of the 24 foods was presented on three separate occasions.

Two six-day intervention phases followed, one of which targeted fruit, the other vegetables. Twelve of the 24 foods (three from each category) were chosen for presentation during the intervention phases; the remaining 12 were reserved for tests of generalisation of the intervention effects (see below). During these intervention phases the children were exposed to a version of the Food Dudes video, and, as in the home studies, could win a range of Food Dude fruit/veg eater prizes for consuming the targeted foods (to which the Food Dudes referred in generic terms as "fruit" and "vegetables"). In an attempt to build team cohesion, a classroom-based save the life force game was also incorporated in the intervention package in which, as well as being able to win stickers and badges as individuals, the children could also win tokens for their team. Tokens were amassed in the Food Dude token collector, and the Food Dudes provided occasional prizes on the basis of numbers of tokens collected by each team. They also sent daily letters to the children offering encouragement, feedback and reminders of what they should do to gain rewards.

A second baseline phase then immediately followed during which all 24 foods, including the 12 foods that had been set aside during the intervention phases, were presented in the absence of video and rewards. This was designed to test for maintenance and generalisation of intervention effects. Follow-up phases were conducted under baseline conditions at four and six months, respectively.

Results

As shown in Figure 2, during the fruit-directed intervention phase consumption of target fruit increased from 28 per cent in baseline to 55 per cent, and remained high in the four- and six-month follow-ups (i.e. 62 per cent and 59 per cent, respectively). The children ate only 8 per cent of the target vegetables in baseline but this increased to 39 per cent during the vegetable intervention and was maintained at levels of 34 per cent and 32 per cent in the follow-ups. Comparing the first baseline to the final follow-up, the children's consumption of fruit more than doubled; their consumption of vegetables increased fourfold. The rise in fruit and vegetable consumption was accompanied by a fall in the consumption of sweet and savoury snacks. In the first baseline, the sweet and savoury snacks were by far the most preferred of the foods; their levels of consumption were 77 per cent and 81 per cent, respectively, in comparison with the very low levels recorded for fruit and vegetables. By the final follow-up, however, the children's consumption of these snacks had dropped to 64 per cent (sweet) and 48 per cent (savoury), whereas fruit and vegetable consumption had both risen greatly. Indeed, following the fruit intervention, the target fruit was the most-consumed, or second most-consumed, category of food. Given the brevity of each intervention period (i.e. six days), and the strong initial popularity of the sweet and savoury snacks, these results are quite remarkable. They show how it is possible to shift children's food choice away, to a considerable extent, from sweet and/or fatty snacks such as chocolate biscuits and crisps towards a range of uncooked fruit and vegetables.

There was also good generalisation of effect from target fruit and vegetables (the consumption of which was rewarded in the relevant intervention phase) to the remaining non-target fruit and vegetables (the consumption of which was never rewarded). Consumption of the non-target fruit rose from 12 per

British Food Journal
100/3 [1998] 133–140

cent (initial baseline) to 38 per cent in the baseline phase following the fruit intervention, and was still at 33 per cent at six-month follow-up. Consumption of non-target vegetables rose from 9 per cent (first baseline) to 23 per cent following the vegetable intervention, and was still at 24 per cent at the six-month follow-up.

Finally, with respect to differences in scores obtained on all three measures (Intent/Choice/Consumption), there was evidence that children overstated their intent to consume. This suggests that it is easier to get children to say that they are going to do something than it is to get them to do it and that consumption itself rather than stated intent should be regarded as the more important measure if one's concern is to change what children actually eat (and see also Lowe *et al.*, in press).

School study 2

Although broadly following that of school study 1, the procedure of this study was modified in a number of ways to enhance the effectiveness of the intervention. Changes included:

- increasing the duration of each intervention phase to 16 days (compared with six days in study 1);
- not presenting sweet and savoury snacks as accompaniments to the fruit and vegetables; and
- introducing, for a selection of the children, procedures in the home context that ran concurrently with those operative in school.

Also, unlike previously, in this study we used cooked vegetables.

Participants and procedure

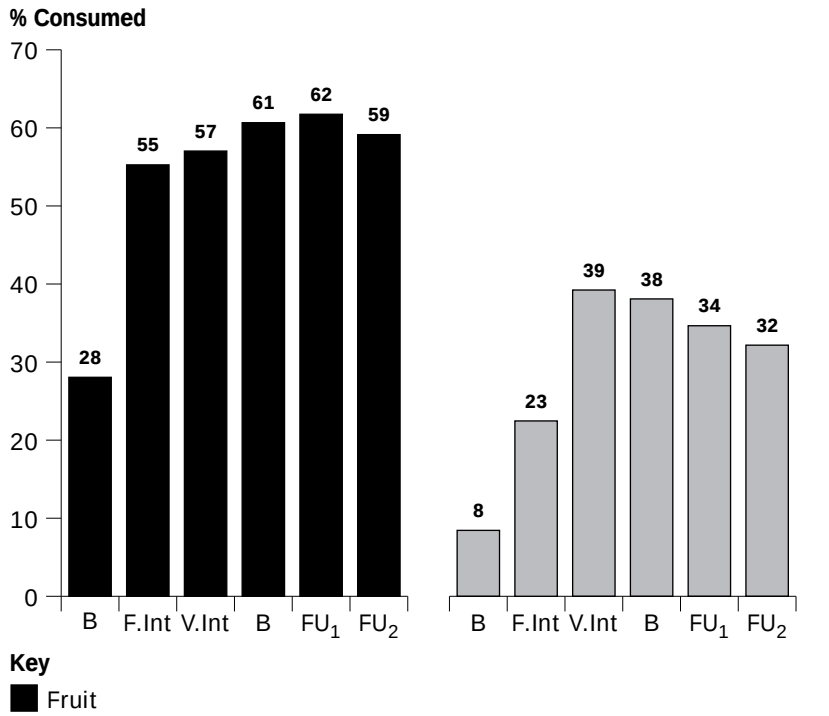
Participants were a class of 28 children of 5-6 years of age, in a different primary school in North Wales. Eight fruits were used (some of which were also employed in study 1) and eight cooked vegetables (e.g. spinach, carrots, broccoli). The baseline and intervention procedures were very similar to those of Study 1 except that each child was presented each day with a tray of two fruit and two vegetables during snack time and could choose to eat as many of these as he/she wished. As in study 1, only half the foods featured in the intervention phases.

In addition, each day during the intervention phases, five of the children were given at home the same fruit and vegetables as were presented in school, and their consumption of these was monitored. At a given stage during each of the intervention phases they were also given "cues" at home to aid generalisation of effects from school to the home setting. These cues took the form of a brief Food Dude video sequence, forms on which to record their own daily fruit and vegetable consumption, and letters from the Food Dudes reminding them of the importance of their eating fruit and vegetables both at home and school. At a later stage in the fruit-directed intervention, rewards (i.e. tokens exchangeable for a present) were also given at home for consumption of fruit ; in the case of only two of the five children, rewards were also given for home consumption of vegetables.

Results

Figure 3 shows that the children's consumption of the target fruit increased from 37 per cent in the first baseline, to 70 per cent during the fruit-directed intervention and stayed at or around this level through to the final follow-up, eight months later. Vegetable consumption rose from 35 per cent (initial baseline) to 84 per cent during the vegetable-directed intervention and was still at 63 per cent six months later (follow-up 2). Bearing in mind that once the interventions had ended, the children were once again subject to all the influences to which they had been exposed previously, their maintenance of such high

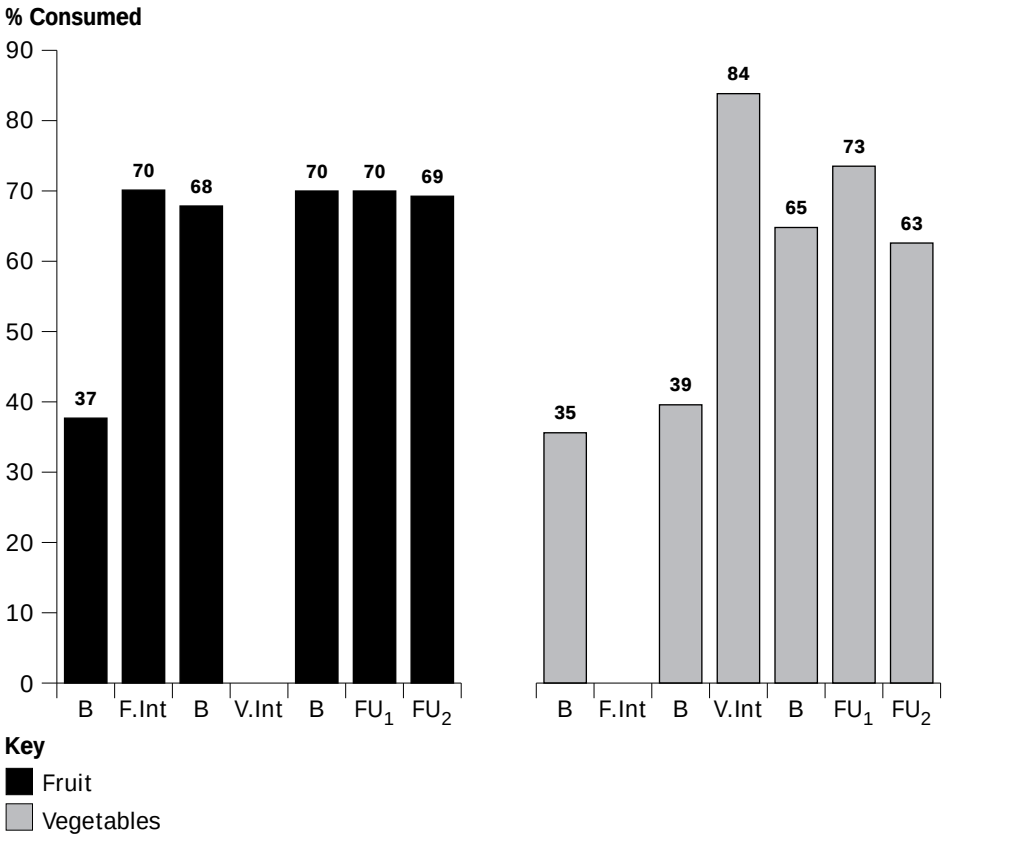
Figure 2
Summary data for a class of 26 children from school study 1 showing mean consumption for target fruit and vegetables



B = baseline; F. Int = fruit intervention; V. Int = vegetable intervention; Fu_1 = four-month follow-up; Fu_2 = six-month follow-up

British Food Journal
100/3 [1998] 133–140

Figure 3
Summary data for a class of 28 children from school study 2 showing mean consumption for target fruit and vegetables



B = baseline phases; F. Int = fruit intervention; V. Int = vegetable intervention
Fu_1 = six-month fruit follow-up and four-month vegetable follow-up
Fu_2 = eight-month fruit follow-up and six-month vegetable follow-up

levels of fruit and vegetable consumption so many months later on is impressive, especially given the relatively small numbers of rewarded taste exposures (i.e. no more than eight) they had to each of the target foods during intervention phases.

Once again there was evidence that intervention effects generalised to those foods that were omitted in the intervention phase but that shared the same generic labels – "fruit", "vegetable" – as the foods that were targeted. In the case of non-target fruit, consumption rose from 42 per cent in first baseline to 61 per cent in the final follow-up; vegetable consumption increased from 23 per cent in first baseline to 39 per cent in the final follow-up. Though not in general as large as the increases for the target food, the increases in consumption of the non-target foods were nevertheless robust and long lasting.

Another important finding in both school studies was that, although there were some differences in consumption levels of individual foods (e.g. carrots were more readily eaten than spinach), substantial increases were recorded in the case of every one of the target and non-target fruit and vegetables.

Generalisation to home

The results obtained from the children monitored at home suggest that, given their experience of the interventions at school, the cues alone (i.e. without rewards) were sufficient to increase considerably their fruit and vegetable consumption levels at home. For the five children overall, fruit consumption increased from 18 per cent (baseline) to 61 per cent with cues, and this was further boosted to 89 per cent by rewards; at the eight-month follow-up, 77 per cent of the fruit was still being consumed at home. The effects on vegetable consumption were also impressive. Following the introduction of the vegetable intervention at school and cues at home, three of the five children increased their vegetable consumption at home from 35 per cent (baseline) to 100 per cent. Without rewards at home or further intervention of any kind these children continued to eat all

British Food Journal
100/3 [1998] 133–140

or almost all of their vegetables, averaging 98 per cent at the final follow-up. The remaining two children increased their consumption from 30 per cent (baseline) to 59 per cent with cues alone, which was then further boosted to 88 per cent with rewards; they ate 64 per cent of the vegetables in the final follow-up. These home results are particularly notable in that they suggest that improvements made to children's diets in one context can, with minimal effort, be made to generalise to a quite different setting.

Indeed, the anecdotal feedback we received after circulating a questionnaire to the parents of all children who participated in school study 2 provided yet more evidence in support of this possibility. All respondents (two-thirds of parents) believed that their children had benefited from taking part in the study, and the vast majority reported that their children were eating more fruit and vegetables at home and requesting the purchase of "new" fruit and vegetables that they would never have asked for previously. Comments were made like, "My son is more likely to try new foods; he will also now eat fruit rather than a chocolate bar without a fuss", and one parent noted gratefully, "In our house it turned vegetroubles into vegetables, and made the things on her plate edible!"

Conclusion

The results of the school studies summarised here both confirm and extend our earlier work on children's food choices (Horne *et al.*, 1995; Lowe *et al.*, in press). To date, all our studies in this domain have shown that children can be influenced to increase their consumption of fruit and vegetables very significantly and that this change in their diets can be wide ranging and long lasting. These findings are clearly of great practical import. For, provided that the basic methodological principles are carefully followed, procedures such as those we have used can be employed at little cost with children anywhere to enable them to adopt eating practices that will incur long-term health benefits (and see Gillman, 1996; Key *et al.*, 1996).

One of the most significant contributions of this work may be to alter adults' conceptualisations about the foods children can or cannot eat. Parents and others responsible for children's wellbeing should not be too pessimistic when children declare that they dislike a particular food. A child can come to make such statements for a variety of reasons, including how she has observed others react to that food, which may not involve her ever having eaten it herself (hence, the commonly observed phenomenon in studies of children's food preferences of "I don't like it, I never tried it"). Her expression of dislike may, however, have unfortunate negative effects not only on her own behaviour but also on that of those who provide food for her. They may too then concur that the child "does not like tomatoes" and so may actively, though unwittingly, reinforce her prejudice. But as our work shows, if adults give them appropriate encouragement and incentives, children can come to taste foods they have previously rejected and can then actually go on to happily incorporate them into their diets. Certainly, when it comes to preferences for fruit and vegetables, children at any age are too young to be written off.

It is children's capacity to change their conceptualisations about food that holds out the greatest hope. It is because our intervention succeeds in bringing about such changes that, we believe, its effects are so long lasting. In the ensuing months and years it is the child's own reconceptualisation of his/her behaviour, in combination with the learning of new taste discriminations, that continues to maintain eating of fruit and vegetables even when extrinsic rewards for doing so are no longer presented.The fact that children have this potential to achieve long-lasting transformations in their eating habits is, thus, the most important message from this research. It is also the message that needs to be acted upon by schools, by health and education agencies and by government. Our work shows how this potential can be realised.

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