The Food Dudes to the rescue!



KATY TAPPER, PAULINE J. HORNE *and* **C. FERGUS LOWE** *describe an innovative scheme to get children to eat their fruit and veg.*

CHILDREN don't like fresh fruit and vegetables. Visit any primary school canteen and you will probably see them tucking into chips, sausages, baked beans and sponge pudding. The school cook will tell you that they turn their noses up at peas and broccoli and always ignore the few lonely looking apples and oranges. The aversion of some children is so great that they will even cry if anything green touches their chips or chicken nuggets.

Such anecdotes are borne out by government statistics. A recent survey (Department of Health, 2000a) showed that 4- to 6-year-olds consume an average of just two portions of fruit and vegetables a day, with less than 4 per cent of children in this age group eating the recommended five or more portions a day. One in ten of these children eat no fruit, half drink no fruit juice and three in five eat no leafy green vegetables.

So why should they? Because fruit and vegetables are essential for health. They contain high levels of vitamins, minerals, fibre and antioxidants, which are vital for normal growth and development and for protection against many common illnesses, such as coughs, colds and flu. They have also been shown to significantly reduce the risk of heart disease, stroke and cancer (see Gillman, 1996), the biggest killers in the UK today. According to experts, if everyone were to eat at least five portions of fruit and vegetables a day, death from these diseases could be reduced by up to 20 per cent (see Department of Health, 2000b). Research also suggests that one of the strongest determinants of fruit and vegetable consumption amongst adults is the extent to which they ate fruit and vegetables as children (Krebs-Smith *et al.*, 1995).

But how can we get children to eat fruit and vegetables? The traditional approach has been through health education campaigns. We inform children and parents of what they should and shouldn't be eating in the hope that they will alter their habits accordingly. However, research suggests that this approach has limited success (Contento *et al.*, 1992; Peterson *et al.*, 1984; Shannon & Chen, 1988). Unfortunately, 'knowing' does not always mean 'doing' – a concept no doubt familiar to anyone who has ever attempted to quit smoking, lose weight or embark on a new exercise regime.

Our approach to the problem

At the Bangor Food Research Unit (BFRU) we have approached the problem from a different angle. Instead of attempting to change knowledge about healthy eating, or attitudes towards particular foods, we tackle food consumption itself. In our efforts to change children's eating habits we have employed three main techniques: taste exposure, modelling and rewards.

Taste exposure The more you taste a novel food the more you learn to like it (Birch & Marlin, 1982; Birch *et al.*, 1987; Pliner, 1982). For example, most people can probably think of things they didn't like as a child that they have learnt to like as an adult, such as olives, Stilton cheese or spicy foods. So getting a child to repeatedly taste a new food may result in his or her learning to like the flavour.

Modelling Research shows that certain factors make modelling (imitation and observational learning) more effective. For example, a child is more likely to imitate another person if that person is liked or admired by the child (Bandura, 1977), is the same age or slightly older (Brody & Stoneman, 1981) and has their behaviour rewarded (Flanders, 1968). Observing multiple models has also been shown to be more effective than observing single models (Fehrenbach *et al.*, 1979). A number of studies have found an impact of modelling on children's food preferences and consumption patterns (e.g. Birch, 1980; Harris & Baudin, 1972; Hendy & Raudenbush; 2000; Jansen & Tenney, 2001).

Rewards This area is more controversial. It has been claimed that rewarding an individual for engaging in a particular task undermines his or her intrinsic motivation for that task (see Deci *et al.*, 1999). However, a large body of research indicates that, when used appropriately, rewards can be very effective at altering behaviour (e.g. Cameron *et al.*, 2001; Dickinson, 1989). Rewards are most effective when they are highly desirable, achievable, their delivery is contingent upon performance, and when they convey the message that they are for behaviour that is both enjoyable and high status (Dickinson, 1989; Lowe *et al.*, 1998).

It is easy to overlook this latter point, but it is perhaps one of the most important. For example, certificates and trophies for hard work and sporting achievements are accepted practice in most schools and are no doubt a good way of motivating children. The message here is clear: 'Well done! You

WEBLINKS

The Food Dudes site: *www.fooddudes.co.uk*
British Nutrition Foundation: *www.nutrition.org.uk*
National Cancer Institute campaign: *www.5aday.gov*
Produce for Better Health Foundation: *www.5aday.com*

should be proud of yourself.' The certificates and trophies are marks of achievement and hopefully the child will work just as hard next time.

However, tell a child 'Eat all your vegetables and then you can have pudding', and the message is entirely different. You are telling the child that pudding is better than vegetables. In addition, the child is likely to feel that their behaviour is being controlled and may also conclude 'If I have to eat vegetables to get pudding, then vegetables must be really nasty!' Although the child may eat the vegetables on this occasion, it is unlikely that they will do so in the future in the absence of pudding.

The 'Food Dudes' at home

Our studies into increasing children's fruit and veg consumption were first carried out in the home environment with a small group of 5- to 6-year-old children (identified by their parents as 'fussy eaters') who ate little fruit and vegetables (see Dowey, 1996; Horne *et al.*, 1995, Lowe *et al.*, 1998). The studies employed a multiple baseline research design (see Kazdin, 1982), in which, following baselines of varying duration, the start of the intervention was staggered over time across foods, being introduced first for fruit and then for vegetable consumption. The studies evaluated the effects of four different procedures on children's consumption of a range of fruit and vegetables presented to them. The procedures were as follows: fruit and vegetable presentation only; rewarded taste exposure; peer modelling; and rewarded taste exposure combined with peer modelling.

The peer-modelling element consisted of a video featuring the heroic 'Food Dudes', a group of four slightly older children who gain superpowers from eating fruit and vegetables. The Food Dudes do battle against the evil 'Junk Punks' who threaten to take over the planet by destroying all the fruit and vegetables, thereby depriving humans of their 'Life Force' foods. Throughout the video the Food Dudes eat and enjoy a variety of fruit and vegetables. The rewards consisted of items such as Food Dude stickers, pens and erasers, awarded to the children for eating target amounts of fruit and vegetables.

The results showed that the combination of peer modelling and rewards was very effective at increasing children's consumption of both fruit and vegetables. Prior to the introduction of the intervention, the children were consuming an average of 4 per cent of the fruit presented to them at home by their parents, and just 1 per cent of the vegetables. However, upon the introduction by their parents of the video and rewards, fruit consumption increased to 100 per cent and vegetable consumption to 83 per cent.

Follow-up measures taken six months later showed that not only were the increases large, they were also maintained over time. The children were still eating 100 per cent of the fruit presented to them and 58 per cent of the vegetables, even though they were no longer receiving the rewards or watching or the video. In addition, there was evidence to show that the effects were not simply restricted to the fruit and vegetables that children had been rewarded for eating, but also occurred for other items children were able to name as fruit or vegetables.

By way of contrast, the results also showed that continued presentation of fruit and vegetables alone had no effect on children's consumption. Likewise, the effects of the peer-modelling video without the rewards were minimal. There were some effects when the rewards were used without the video (especially with fruit), but by far the greatest increases in consumption were achieved when the video and rewards were combined. We believe that because the rewards are labelled as 'Food Dude' items, they acquire considerable potency through their association with the characters on the video, and that for this reason the effects of the combined elements are greater.

However, to be of real practical use to agencies with an interest in improving children's diets, the programme would have to prove that it was capable of effecting big increases in fruit and vegetable consumption in large groups of children. So we set about establishing whether the programme could be adapted for use with large numbers of children in school and nursery settings.

Jarvis and Jess in the nursery

In the nursery setting participants were 26 two- to four-year-olds attending the university's daycare nursery and Centre for Child Development (see Woolner, 2000). The study was largely implemented by the nursery nurses and the video-modelling component of the programme used animated characters called 'Jarvis and Jess', specifically tailored to the nursery school age range.

The intervention was introduced at 'snacktime', (a period just before mid-morning break) first for fruit, then later for vegetables. Levels of fruit and vegetable consumption at lunchtime in the dining room were also recorded. There were never any rewards or video at lunchtime, but measures were taken to determine whether any of the snacktime effects would carry over to the lunchtime context.

The results showed that following the introduction of the intervention, fruit consumption at snacktime rose from 30 per cent to 71 per cent. The intervention was followed by a maintenance phase during which there were no videos and the rewards became more intermittent (a procedure known to be effective in maintaining behaviour – see Kazdin, 1994). At follow-up, 15 months later, consumption levels were 79 per cent. The effects at lunchtime mirrored those at snacktime, rising from a baseline of 17 per cent to 76 per cent at the 15-month follow-up.

Similarly, in the case of vegetables, consumption during snacktime rose from

34 per cent at baseline to 87 per cent following the intervention, and was still at 86 per cent at the follow-up nine months later. The increases for lunchtime consumption of vegetables were even larger, rising from 20 per cent at baseline to 89 per cent at follow-up. Three years later, with very intermittent maintenance procedures, the culture of the nursery school has altered so that children are now consuming approximately 80 per cent of the fruit and vegetables presented to them in the snacktime and lunchtime settings.

Into the classroom

Studies were also carried out with classes of primary school children in schools in Bangor in North Wales (see Horne *et al*., 1998). The first of these was conducted with a class of 26 children aged 5–6 years. It is characteristic of many children's diets that though they fail to eat sufficient fruit and vegetables, they do habitually consume snack foods that are high in saturated fat and sugar. Therefore an important aspect of this study was that it tested whether the programme was potent enough to increase children's consumption of fruit and vegetables even in the face of the competing availability of popular sweet and savoury snacks. Fruit and vegetables were presented at breaktime side by side with sweet and savoury snacks such as chocolate bars, cakes and crisps. The children were free to choose whatever foods they wanted.

Even under these conditions fruit consumption more than doubled, from 28 per cent at baseline to 59 per cent at the six-month follow-up. Consumption of vegetables increased fourfold, from just 8 per cent at baseline to 32 per cent at follow-up. Accompanying the rise in fruit and vegetable consumption was a substantial fall in the consumption of the sweet and savoury snack foods. These results show that it is possible to shift children's food choices away from sweet and fatty snacks towards more healthy alternatives.

The second study was conducted with a class of 28 children, also aged 5–6 years. In addition, a subset of these children participated in a concurrent home-based study during which fruit and vegetable consumption was monitored and a small home intervention was introduced. The results showed large and long-lasting increases in fruit and vegetable consumption in both the classroom and home contexts. These results are important, since they indicate that the effects can be made to generalise from the school context to the home.

The 'whole-school' programme

We have recently completed the development and evaluation of a 'whole school' Food Dude programme for use across the entire primary age range (4–11 years). The programme is designed to be implemented entirely by school staff and contains the following elements:

- A Food Dude video containing six 6-minute adventure episodes.
- A set of Food Dude rewards.
- A set of letters from the Food Dudes. These provide praise and encouragement and remind children of the reward contingencies.
- A Food Dude homepack to encourage children to eat fruit and vegetables in the home context as well as at school.
- A staff manual and staff briefing video to help teachers implement the programme correctly.
- A set of education support materials to help teachers meet curriculum targets using the Food Dude theme.

The main intervention phase of the programme lasts for a period of 16 days during which children watch the Food Dude video episodes and listen to their teacher read out the Food Dude letters. Children also receive rewards when they eat the fruit and vegetables that are presented to them. They receive a Food Dude sticker for tasting a food, or a sticker and a small prize for eating a whole portion.

The intervention phase is followed by a maintenance phase during which there are no videos and the letters and rewards become more intermittent. It is possible to implement the programme either at snacktime or lunchtime or at both.

Evaluating the programme

Initial evaluation of the new whole-school programme was carried out in three schools, in Bangor in North Wales, Harwell in Oxfordshire and Salford in Manchester (see Lowe *et al*., 2001; Lowe *et al*., 2002). The studies showed that the programme resulted in large, statistically significant increases in fruit and vegetable consumption in all three schools at both snacktime and at lunchtime. The increases occurred for both boys and girls in infant and junior classes (4–7 and 7–11 years respectively).

Data collected from a subset of parents in the Salford school also showed a significant increase in the number of portions of fruit and vegetables consumed on weekdays. (The number of portions consumed on weekend days showed an increase but this failed to reach statistical significance. Since most of the programme was delivered at school during the weekdays, the absence of change at the weekend may have occurred due to a lack of appropriate cues, e.g. being reminded at home of the positive consequences of eating fruit and vegetables.)

Further evaluation of the programme was carried out in two schools in Lambeth in south London (see Lowe *et al*., 2002; Tapper *et al*., 2002). One of these acted as an experimental school, receiving the full Food Dude programme, whilst the other acted as a control and simply received the additional fruit and vegetables for the duration of the study. Again, the results showed significant increases in fruit and vegetable consumption at snacktime and at lunchtime in the experimental school, but not in the control school. Follow-up measures, conducted four months after the end of the intervention, also showed that children in the experimental school were still eating significantly more fruit and vegetables at lunchtime than they had been prior to the introduction of the programme.

Teachers and parents also responded very positively. As well as commenting on how much children had enjoyed the programme, teachers reported additional benefits such as enthusiasm for curriculum work using the Food Dude theme, improved school attendance and an increased confidence amongst children who were not normally big achievers. Likewise, almost all of the parents who returned a questionnaire sent to them at the end of the study felt that their child had enjoyed and benefited from taking part.

Why does it work?

We believe the programme works in three main ways. Firstly, children discover the intrinsically rewarding properties of fruit and vegetables and develop a liking for them. As we have seen, there is evidence to show that if we taste a food enough times we may actually learn to enjoy it. The

intervention gets children to taste fruit and vegetables repeatedly; eventually they eat them for the taste, even when they are no longer receiving the rewards.

Secondly, we believe that the programme changes the culture within the school to one that strongly supports the eating of fruit and vegetables. So children get social reinforcement from their peer group for eating fruit and vegetables: it becomes a cool thing to do rather than something for which they are ostracised.

And thirdly, children come to see themselves as 'fruit and vegetable eaters' and are guided by this self-concept. So for example, on being presented with a piece of fruit they may say to themselves 'I like fruit' or 'I always eat my fruit', and these rules influence their behaviour.

The future of the programme

We have had a great deal of interest in the programme from government agencies. The Food Standards Agency has commissioned us to coordinate and evaluate the programme in schools in Wales. This evaluation will include follow-up measures taken at six- and twelve-month intervals. A modified version of the programme is also being

piloted by the Department of Health in schools in London and Plymouth. And in Scotland a modified version of the programme has already been rolled out to 210 schools in Glasgow and is also being piloted in schools in Forth Valley.

We hope that these pilots will lead to government agencies' support for the programme in order to make it available to all schools in the UK. The results of our studies to date clearly show that the programme can bring about large and long-lasting increases in children's consumption of fruit and vegetables. If implemented nationally, this could result in major health benefits for millions of schoolchildren.

The peer-modelling and rewards-based approach used here could be adapted to help bring about other forms of behaviour change in health domains. For example, in an effort to combat the growing problem of obesity, the BFRU team are currently investigating how similar interventions might be used to help children and older adults not only to eat more healthily, but also to become more physically active. Whether it be eating sensibly, being active, not smoking, or indeed any other course of action that can improve health and well-being, we believe that great gains can be made for people – not simply by informing them of what they should and shouldn't be doing, but by applying known behaviour principles in a systematic and coherent position that is well grounded in the basic research literature on human learning.

■ *Katy Tapper is Project Manager at the Bangor Food Research Unit, School of Psychology, University of Wales, Bangor. E-mail: k.tapper@bangor.ac.uk.*
■ *Pauline Horne is a Director at the Bangor Food Research Unit. E-mail: p.j.horne@bangor.ac.uk.*
■ *C. Fergus Lowe is a Director at the Bangor Food Research Unit. E-mail: c.f.lowe@bangor.ac.uk.*

References

Bandura, A. (1977). *Social learning theory.* New Jersey: Prentice-Hall.

Birch, L.L. (1980). Effects of peer models' food choices and eating behaviors on preschoolers' food preferences. *Child Development, 51*, 489–496.

Birch, L.L. & Marlin, D.W. (1982). 'I don't like it, I never tried it': Effects of exposure on two-year-old children's food. *Appetite, 3*, 353–360.

Birch, L.L., McPhee, L., Shoba, B.C., Pirok, E. & Steinberg, L. (1987). What kind of exposure reduces children's food neophobia? Looking vs. tasting. *Appetite, 9*, 171–178.

Brody, G.H. & Stoneman, Z. (1981). Selective imitation of same-age, older and younger peer models. *Child Development, 52*, 717–720.

Cameron, J., Banko, K.M. & Pierce, W.D. (2001). Pervasive negative effects of rewards on intrinsic motivation: The myth continues. *The Behavior Analyst, 24*, 1–44.

Contento, I.R., Manning, A.D. & Shannon, B. (1992). Research perspective on school-based nutrition education. *Journal of Nutrition Education, 24*, 247–260.

Deci, E.L., Koestner, R. & Ryan, R.M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*, 627–668.

Department of Health (2000a). *National Diet and Nutrition Survey: Young people aged 4 to 18 years. Volume 1: Report of the diet and nutrition survey.* London: The Stationery Office.

Department of Health (2000b). *The NHS Plan: A plan for investment, a plan for reform.* London: The Stationery Office.

Dickinson, A.M. (1989). The detrimental effects of extrinsic reinforcement on 'intrinsic motivation'. *The Behavior Analyst, 12*, 1–15.

Dowey, A.J. (1996). *Psychological determinants of children's food preferences.* Unpublished doctoral dissertation, University of Wales, Bangor.

Fehrenbach, P.A., Miller, D.J. & Thelen, M.H. (1979). The importance of consistency of modeling behavior upon imitation: A comparison of single and multiple models. *Journal of Personality and Social Psychology, 37*, 1412–1417.

Flanders, J.P. (1968). A review of research on imitative behavior. *Psychological Bulletin, 69*, 316–337.

Gillman, M.W. (1996). Enjoy your fruits and vegetables: Eating fruit and vegetables protects against the common chronic diseases of adulthood. *British Medical Journal, 313*, 765–766.

Harris, M.B. & Baudin, H. (1972). Models and vegetable eating: The power of Popeye. *Psychological Reports, 31*, 570.

Hendy, H.M. & Raudenbush, B. (2000). Effectiveness of teacher modelling to encourage food acceptance in preschool children. *Appetite, 34*, 61–76.

Horne, P.J., Lowe, C.F., Bowdery, M. & Egerton, C. (1998). The way to healthy eating for children. *British Food Journal, 100*, 133–140.

Horne, P.J., Lowe, C.F., Fleming, P.F. & Dowey, A.J. (1995). An effective procedure for changing food preferences in 5–7 year-old children. *Proceedings of the Nutrition Society, 54*, 441–452.

Jansen, A. & Tenney, N. (2001). Seeing mum drinking a 'light' product: Is social learning a stronger determinant of taste preference acquisition than caloric conditioning? *European Journal of Clinical Nutrition, 55*, 418–422.

Kazdin, A.E. (1982). *Single-case research designs: Methods for clinical and applied settings.* Oxford: Oxford University Press.

Kazdin, A.E. (1994). *Behavior modification in applied settings.* Pacific Grove, CA: Brooks/Cole.

Krebs-Smith, S.M., Heimendinger, J., Patterson, B.H., Subar, A.F., Kessler, R. & Pivonka, E. (1995). Psychosocial factors associated with fruit and vegetable consumption. *American Journal of Health Promotion, 10*, 98–104.

Lowe, C.F., Dowey, A.J. & Horne, P.J. (1998). Changing what children eat. In A. Murcott (Ed.) *The nation's diet: The social science of food choice.* (pp.57–80). London: Longman.

Lowe, C.F., Horne, P.J., Bowdery, M.A., Egerton, C. & Tapper, K. (2001). Increasing children's consumption of fruit and vegetables [Abstract]. *Public Health Nutrition, 4*, 387.

Lowe, C.F., Horne, P.J., Tapper, K., Jackson, M., Hardman, C., Woolner, J. *et al.* (2002). *Changing the nation's diet: A programme to increase children's consumption of fruit and vegetables* (Technical report). University of Wales, Bangor, Bangor Food Research Unit.

Peterson, P.E., Jeffrey, D.B., Bridgwater, C.A. & Dawson, B. (1984). How pronutrition television programming affects children's dietary habits. *Developmental Psychology, 20*, 55–63.

Pliner, P. (1982). The effects of mere exposure on liking for edible substances. *Appetite, 3*, 283–290.

Shannon, B. & Chen, A.N. (1988). A three-year school based nutrition education study. *Journal of Nutrition Education, 20*, 114–124.

Tapper, K., Lowe, C.F., Horne, P.J., Jackson, M.C., Hardman, C.A. & Woolner, J. (2002). An intervention to increase children's consumption of fruit and vegetables [Abstract]. *Proceedings of The British Psychological Society, 10*, 102.

Woolner, J. (2000). *Children's food preferences – A behavioural analysis.* Unpublished doctoral dissertation, University of Wales, Bangor.