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Research report

Positive- and negative peer modelling effects on young children's consumption of novel blue foods

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ABSTRACT

Objective: The effects of positive- and negative peer modelling on children's consumption of a novel blue food, presented in each of four snack meals during an "activity" day, were evaluated. It was predicted that: (i) novel food consumption would increase after positive modelling, but decrease after negative modelling; (ii) modelling effects would generalise to a second novel blue food when participants were alone when they ate their snack; (iii) that positive modelling would reverse the effects of negative modelling.
Design: A mixed design was employed with random assignment to either Groups A, B, or C (equal numbers of males and females per group). Within groups, each participant received the novel food on four snack occasions. Group A received positive modelling of blue food consumption on the first and third occasions, but were alone when they received the foods on the second and fourth occasions; Group B had negative modelling on the first occasion, positive modelling on the third, and ate alone on the second and fourth; Group C ate alone on all four occasions. To measure generalisation, an additional blue food was presented in all second and fourth "alone" occasions.
Participants: Thirty-five 5–7-year olds took part in Study 1, and 44 3–4-year olds in Study 2.
Results: All main predictions were confirmed except that positive peer modelling did not reverse the effects of negative modelling in the 3–4-year olds.
Conclusion: Negative peer modelling inhibits novel food consumption, and its effects are particularly difficult to reverse in younger children.

Introduction

The aim of the two studies reported here is to determine whether peer modelling can influence young children to consume or reject a novel food. The term "modelling" is used in this context to describe the demonstration of particular behaviour(s) to others. Although such demonstrations do not necessarily result in the modelled behaviours being matched by the observer, when matching does occur it provides a very efficient mechanism by which cultural practices, including food-related behaviours, can be transmitted from one human to another (Meltzoff, 2005). The social learning account (Bandura, 1977) suggests that observers are most likely to imitate the behaviour of others when (i) they like or admire the person performing the behaviour, (ii) they see that person being rewarded for performing the behaviour, (iii) they, themselves, are rewarded for imitating the modelled behaviour, and (iv) when they see more than one person performing the behaviour. As regards imitation of food acceptance, a number of studies have investigated the effectiveness of live models in encouraging children's acceptance of foods. These studies have found that modelling of food consumption by parents (Harper & Sanders, 1975; Jansen & Tenney, 2001), teachers (Hendy & Raudenbush, 2000), other adults (Addessi, Galloway, Visalberghi, & Birch, 2005; Harper & Sanders, 1975) and other children (Birch, 1980; Duncker, 1938; Marinho, 1942) can increase children's acceptance of particular foods.

Whereas Harper and Sanders (1975) found that modelling by mothers, but not strangers, could influence children to consume a particular food, Hendy and Raudenbush (2000) showed that although enthusiastic teacher modelling could be used to encourage young children's acceptance of novel foods (mango, kiwi and dried apples), the children's observations of peers with competing preferences could neutralise the effects of the teacher model. This suggests that peer influence on food acceptance can be stronger than adult influence, even when the adult is well known to the child.

Regarding the characteristics of effective peer models, a number of studies have reported that peers who are older than the target children seem to be more influential than peers who are younger. Duncker (1938) found that individual kindergarten

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children changed their initial rankings of familiar foods to match those of a group of peers who demonstrated different rankings for those foods; however, greater influence on preference was found for younger children who observed models older than themselves as compared with older children who observed younger peers. Birch (1980) examined changes in relative preference for foods before and after peer modelling in children seated with a group of 3 or 4 peers with food preferences opposite to their own. Older peers were particularly influential in changing preschool children's preference ratings, choices and consumption of vegetables at lunchtime in the direction of those of the peer group. Peer age effects on children's verbal preferences among colour pictures of various foods have also been reported (Stoneman & Brody, 1981). In Study 1, each child was assigned one peer model, either of the same age as, or 2 years older, or 2 years younger than the child. A post-modelling memory test showed that the children who observed the food picture choices of their respective peer model remembered accurately which foods the peer preferred. However, when next asked to choose among the food slides with no peer present, they were less likely to imitate the choices that were made by a younger peer than the choices of a same age or older peer. As in the Birch study, there were no sex differences in changes of children's food preferences. Behavioural characteristics of both observers and peer models may also moderate peer influence on preschool children's food choices. Marinho (1942) categorised children's baseline preferences for six different kinds of fruit paste into behavioural "types" depending on the day-to-day stability of the children's choices over a 3-month period. Of children who showed high baseline stability, described as "predominant" choosers, only half of their choices matched those modelled by their assigned peer model. Of children who showed no stability of choice among the foods throughout their baseline, described as "indefinite" choosers, all changed their food choices to match those of their assigned peer models. However, Marinho also found that "socially agreeable" peers were more effective than "socially domineering" peers at changing observer children's food choices. Therefore, whether or not a peer influences food choice appears to depend not only on characteristics of the child as observer, but also those of the peer model. Taken together, these studies show that the food preferences of children, whether based on verbal measures of preference among pictures of foods or actual consumption, can be influenced by the preferences modelled by their peers, particularly those who are of the same age or older than themselves.

In addition to live models, the impact of video peer models, the "Food Dudes", who offer rewards to children who eat fruit and vegetables, has also been studied. The Food Dudes are four characters, two males and two females, engaged in battle with the evil Junk Punks who are attempting to steal energy from the children of the world. In six video episodes, the Dudes are shown to gain power over their adversaries by eating healthful fruit and vegetables and they enjoin children to help them to defeat the evil gang by consuming these "life force" foods. When combined with contingent rewards for consuming these foods, these video peer models have been found to be very effective at increasing fruit and vegetable consumption in children ranging in age from 4 to 11 years, over as long as 1 year after the intervention (Horne, Lowe, Fleming, & Dowey, 1995; Horne et al., 2004; Horne et al., 2008; Lowe, Horne, Tapper, Bowdery, & Egerton, 2004).

To exert strong peer influence on food acceptance, it appears that there should be several peer models acting as a group, who are older than the target children, as well as successful, likeable, and socially admired. However, very little is known about the kinds of peers who would be most effective at establishing rejection of foods. Focus group studies (Cullen, Baranowski, Rittenberry, & Olvera, 2000) have provided anecdotal evidence from some children that peers often made negative comments about eating vegetables, although these children also said that the negative comments would not affect their consumption of a vegetable they already liked. As yet, there appears to be no systematic study of the effects of negative peer modelling on children's food preferences, either for familiar or novel foods.

In the present studies we investigated the effects of both positive and negative peer modelling on children's consumption of novel foods. With the aim of maximising the potency of these positive and negative independent variables, modelling was presented by four confederate peers—the same number as employed by Birch (1980) and in the Food Dudes intervention. Consistent with the literature reviewed above, the confederates were also older than the participants and, to control for any possible gender bias, two were males and two were females. The design has a number of distinct features, namely: the use of two completely novel foods and the use of consumption as the outcome measure (rather than preference, choice or bites). In particular, the type of peer influence was different between groups and phases so that the effects of both positive and negative modelling, and the reversibility of negative influence, could be examined. Both experiments employed a similar procedure, the major difference being the age ranges of the participants. The results of each experiment will be discussed individually and then comparatively.

Study 1

Method

Participants

Thirty-six children aged between 5 and 7 years were recruited from three local primary schools. Pupils attending the schools were given an information and consent letter to take home to their parents or guardians. Children needed written parental consent to take part in the study. From the pool of consent letters, six boys and six girls from each school were randomly selected to participate; one child failed to attend on the day of the study.

A further eight children aged between 8 and 11 years were recruited to act as confederates; these children did not attend the same school as the younger participants. The School of Psychology Ethics Committee at Bangor University gave approval for the study to be conducted.

Foods

Two novel target foods were "created" for presentation. These were potato bread and quorn, both of which were coloured blue and given the names "fodrick" and "gwark", respectively. Neither food, in its non-blue form, was widely available, and there were few blue snack foods on sale at the time of the study (Walsh, Toma, Tuveson, & Sondhi, 1990). The target foods were presented on a paper plate together with other snack foods, which included: grapes, cheese, pitta bread and carrot. Portion size for each food (including target foods) during each presentation was approximately equivalent to 30 ml. Each plate was labelled on the underside so that the individual recipient could be identified.

Measures

The dependent variable was the amount of each blue food consumed by each participant. An observer, blind to experimental condition, visually estimated consumption from each participant's plate waste using a five-point scale (for validation of this measure, see Lowe et al., 2004). The children tended to consume all or none of the target foods and so inter-observer checks were considered unnecessary. Foods other than the target foods were presented to provide a context for the target foods; therefore consumption of these was not measured.

Table 1
Presentation context of novel foods.

Presentation	Group A	Group B	Group C
1	Positive peer modelling	Negative peer modelling	No peers
2	No peers (Generalisation Test 1)	No peers (Generalisation Test 1)	No peers (Generalisation Test 1)
3	Positive peer modelling	Positive peer modelling	No peers
4	No peers (Generalisation Test 2)	No peers (Generalisation Test 2)	No peers (Generalisation Test 2)

An experimenter present during each of the four food presentations ensured that any non-consumed food remained on the participant's plate.

Design and procedure

A mixed design was employed in which participants were randomly allocated to one of three conditions (between groups), with the constraint that each group had equal numbers of males and females. Target food consumption was recorded across four separate occasions within each group (within subjects). Across groups, participants were exposed to different forms of peer influence with respect to the target food, and alternate conditions with no peers present. These conditions are outlined in Table 1.

The design permitted comparison both between and within groups. Moreover, generalisation of effect across contexts was examined by presenting the target food first in the presence and then in the absence of peers. Second, at two points during the study (Generalisation Test 1 and Generalisation Test 2), participants were also presented (in the absence of peers) with a second novel blue food, thus measuring generalisation of any effects of the peer interventions to another novel food of the same colour as the target food.

A key element of the design was that in addition to the comparison of positive and negative peer influence (with respect to food consumption) it was also possible to examine whether positive peer modelling would reverse the effects of prior negative peer modelling.

A number of controls were included. The primary aim of producing a "novel" food was to control for participants' existing food preferences. (It was also important to avoid using foods that may be found in the child's everyday environment given that one aim of the study was to examine the effects of negative peer modelling on food choice.)

Differences between the two novel foods might affect their consumption and so half of the participants in each group were presented with quorn as the target food, the other half with potato bread. To counter any performance differences among the groups of confederates, both provided both negative and positive interventions.

Variances in the educational experiences of participants (e.g., one school had recently implemented a healthy eating programme) were considered important and therefore equal numbers of children from each of the three schools were assigned to each of the three groups.

The procedures were implemented within the context of an "activity day" at Bangor University's Day Care Nursery and Centre for Child Development. The study took place over a number of weekends, with up to six participants in attendance on each of these test days. Each 'day' lasted for approximately 3 h. For the first hour, the confederates and participants played a number of team games together (to establish the confederate peers as role models). For 2 h following the team games, the participants undertook a range of individual activities. Whilst participants were engaged in individual activities, including food presentations, they did not interact with one another, and beyond the team games, the only contact between confederates and participants was during the 5 min snack sessions (except in the "alone" presentations). Presentation 1 began immediately after the team games. Following Presentation 1, individual games were played for a further 15–20 min before Presentation 2 began. This continued for Presentations 3 and 4. Each session ended with a party for participants and confederates.

Presentation 1

Group A: positive peer modelling. During the first food presentation the participant was seated at a table with the four confederates. Four snack foods and the target blue food were presented together on a plate, first to each confederate, and then the participant, by an experimenter who remained in the room. Upon receipt of the food, each confederate repeated a line from a rehearsed script, making a positive statement about the target food, and then consumed it. No other comments about any other food were made and the participant was not directly prompted to consume any food. After 5 min the session finished and the participant returned to the individual activities.

Group B: negative peer modelling. Conditions during this presentation were the same as for the positive peer modelling, except that the confederates repeated rehearsed lines making negative comments about the target food, and did not eat it.

Group C: control. The participant was given the target and other snack foods in a room where there was an experimenter, but no confederates or other children present. The experimenter did not prompt the child to eat any of the foods.

Presentation 2

In this "alone" condition, each participant was presented with a plate containing the target food, the second blue food, and the four other snack foods, in a room with only the experimenter present.

Presentation 3

For Groups A and C, the third presentations replicated those during Presentation 1, but with four new confederates for Group A. Group B was also exposed to new confederates who provided positive peer modelling as described for Presentation 1 (Group A: positive peer modelling).

Presentation 4

These "alone" conditions replicated those in Presentation 2, for all participants.

Results

Fig. 1 shows for each group the mean percentage of target food consumed during each presentation. Fig. 2 shows the percentage consumed of the target food (solid bars) and second blue food (hatched bars) when these were presented in the absence of confederates during Generalisation Test 1 (Presentation 2) and Generalisation Test 2 (Presentation 4).

Statistical analyses

The distribution of the data was found to be bi-modal. Non-parametric analyses were therefore employed throughout and only the main hypotheses were tested.

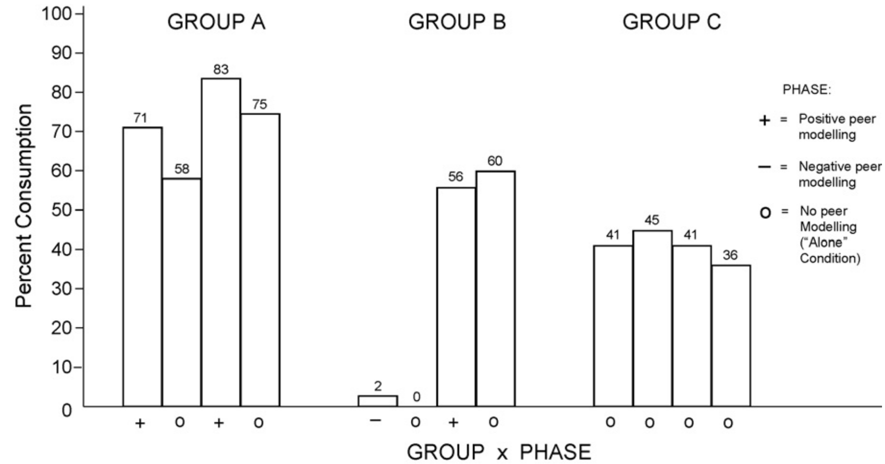

Fig. 1. Mean percent consumption of target food for each group of 5–7-year-old children in each of four presentation phases.

Target food consumption. In order to test the hypothesis that effects of peer modelling would generalise to the subsequent "alone" food presentations, participants' consumption was compared across Presentations 1 and 2, and likewise, across Presentations 3 and 4. There was no significant difference in consumption either between Presentations 1 and 2 ($p = .250$), or Presentations 3 and 4 ($p = .373$; Wilcoxon, one-tailed tests, respectively). Subsequent analyses were conducted on either the combined data from Presentations 1 and 2 (Phase 1), or the combined data from Presentations 3 and 4 (Phase 2).

A one-way analysis of variance conducted on the Phase 1 data found significant between group differences in target food consumption (Kruskal–Wallis, $\chi^2 = 16.498$, d.f. = 2, $p < .001$). Mann–Whitney post hoc comparisons, with Bonferroni corrections applied ($p < .017$), found: (i) a significant difference between Group A (positive modelling) and Group B (negative modelling; $p < .001$); (ii) a significant difference between Group B and the control, Group C ($p = .002$), but no significant difference between Groups A and C ($p = .100$); all tests were one-tailed. A one-way analysis of variance was next conducted on the Phase 2 data; no significant between group differences were found (Kruskal–Wallis, $\chi^2 = 4.553$, d.f. = 2, $p = .103$). In Group B (Phase 1: negative modelling; Phase 2: positive modelling) there was a significant difference in target food consumption in Phase 1 versus Phase 2 (Wilcoxon, $p = .003$).

Second blue food consumption. Fig. 2 shows, for each group, mean percent consumption of the target and second blue food, in the absence of confederates, during Presentations 2 and 4. In order to test the hypothesis that modelling effects would generalise to the second blue food, consumption of the target blue food and the second blue food was compared for all participants in each phase of the study. At Presentation 2 (Phase 1) no significant difference was found between target and second blue food consumption (Wilcoxon, $p = .931$). At Presentation 4 (Phase 2), there was a significant difference in the consumption of these two foods (Wilcoxon, $p = .007$). A one-way analysis of variance conducted on the second blue food consumption data for Presentation 4 found significant between group differences (Kruskal–Wallis, $\chi^2 = 6.148$, d.f. = 2, $p = .046$). Mann–Whitney one-tailed post hoc comparisons, with Bonferroni corrections ($p < .017$), found a significant difference ($p = .013$) in second blue food consumption between Group A (Phases 1 and 2: positive modelling) and Group B (Phase 1: negative modelling; Phase 2: positive modelling), but no significant difference in consumption between Group A and the no-modelling control, Group C ($p = .028$), or between Groups B and C ($p = .311$).

Discussion

The results of Study 1 show that 5–7-year-old children consumed a novel blue food after exposure to positive peer modelling, whereas negative peer modelling resulted in floor levels of consumption. In Phase 1, the effects of positive and negative peer modelling persisted in the subsequent "alone" presentation

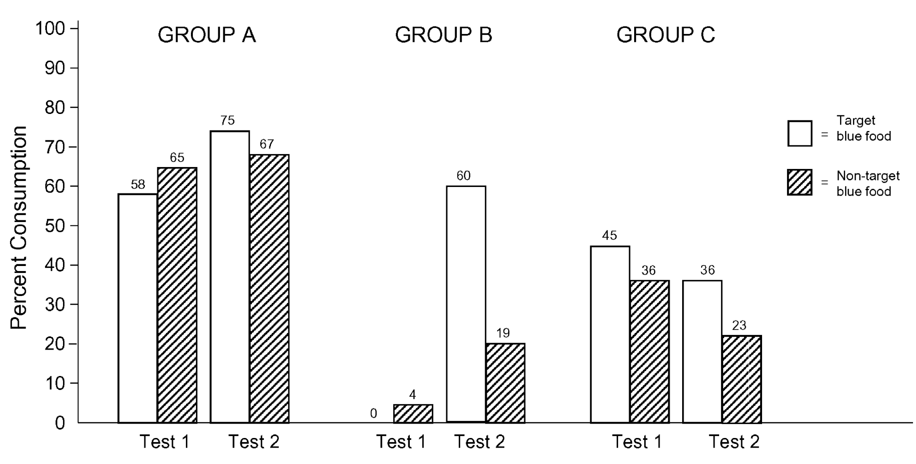

Fig. 2. For each group of 5–7-year-old children, mean percent consumption of target blue food and second blue food in Generalisation Tests 1 and 2.

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and generalised to the second novel blue food. In Phase 2, the effects of the negative peer modelling on target blue food consumption were successfully reversed when Group B next received a positive modelling presentation. However, this reversal did not generalise to the second blue food. Although the difference between the positive modelling- and control groups did not reach significance, there was a strong trend in that direction, particularly in Phase 2 when the second positive modelling presentation was given for Group A.

Negative peer modelling appears to have a potent impact on novel food consumption and may be more powerful than positive modelling. In the presence of negative peer modelling, only one child consumed any target food (25%) and none of the children in this group ate the food when there were no peers present.

Study 2

Method

The second study was similar to the first, with the following methodological differences. Forty-nine participants aged between 3 and 4 years were recruited through letters sent to schools, nurseries and children's interest groups. Posters were also displayed in supermarkets, libraries, and leisure centres. The participants were randomly assigned to one of three groups with the constraint that there were equal numbers of males and females, and similar numbers of 3- and 4-year olds, in each group. One child did not complete all the experimental procedures and four did not attend on their allotted day. These children were excluded from the final analysis. Confederates were all recruited from one school and were aged between 6 and 9 years.

Trained nursery nurses were employed to supervise the participants. Each session was scheduled for a morning or afternoon (approximately 3.5 h) and the initial group activities lasted for half an hour. The portion size of each food presented was approximately 20 ml.

Results

Fig. 3 shows the mean percentage of target food consumed during each presentation. Fig. 4 shows the percentage consumed of the target food (solid bars) and second blue food (hatched bars) when these were presented in the absence of confederates during Generalisation Test 1 (Presentation 2) and Generalisation Test 2 (Presentation 4).

Statistical analyses

As in Study 1, the distribution of the data was found to be bi-modal. Non-parametric analyses were therefore employed throughout and tests were confined to the main hypotheses.

Target food consumption. In order to test the hypothesis that peer modelling effects would generalise to the subsequent "alone" food presentations, participants' consumption was compared across Presentations 1 and 2, and across Presentations 3 and 4. There was no significant difference in consumption either between Presentations 1 and 2 ($p = .370$), or Presentations 3 and 4 ($p = .079$; Wilcoxon one-tailed tests, respectively). Subsequent analyses were conducted on either the combined data from Presentations 1 and 2 (Phase 1), or the combined data from Presentations 3 and 4 (Phase 2).

A one-way analysis of variance conducted on the Phase 1 data found significant between group differences in target food consumption (Kruskal–Wallis, $\chi^2 = 14.118$, d.f. = 2, $p = .001$). Mann–Whitney pairwise post hoc comparisons, with Bonferroni corrections applied ($p < .017$), found: (i) a significant difference between Group A (positive modelling) and Group B (negative modelling; $p < .001$); (ii) a significant difference between Group B and the control, Group C ($p = .001$), but no significant difference between Groups A and C ($p = .270$); all tests were one-tailed. A one-way analysis of variance conducted on the Phase 2 data found between group differences (Kruskal–Wallis, $\chi^2 = 12.693$, d.f. = 2, $p = .002$). Mann–Whitney pairwise post hoc comparisons, with Bonferroni corrections applied ($p < .017$), found: (i) a significant difference between Group A (Phases 1 and 2: positive modelling) and Group B (Phase 1: negative modelling; Phase 2 positive modelling; $p < .001$); (ii) a significant difference between Group B and the control, Group C ($p = .009$), but no significant difference between Groups A and C ($p = .093$); all tests were one-tailed.

Second blue food consumption. Fig. 4 shows, for each group, mean percent consumption of the target and second blue food, in the absence of confederates, during Presentations 2 and 4. In order to test the hypothesis that modelling effects would generalise to the second blue food, consumption of the target blue food and the second blue food was compared for all participants in each phase of the study. No significant differences were found between target and second blue food consumption either at Presentation 2 (Wilcoxon, $p > .99$), or at Presentation 4 (Wilcoxon, $p = .079$).

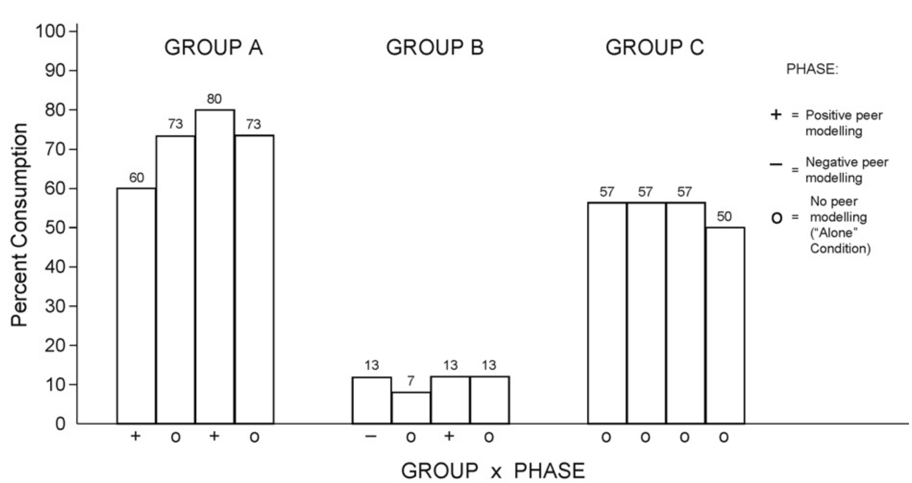

Fig. 3. Mean percent consumption of target food for each group of 3–4-year-old children in each of four presentation phases.

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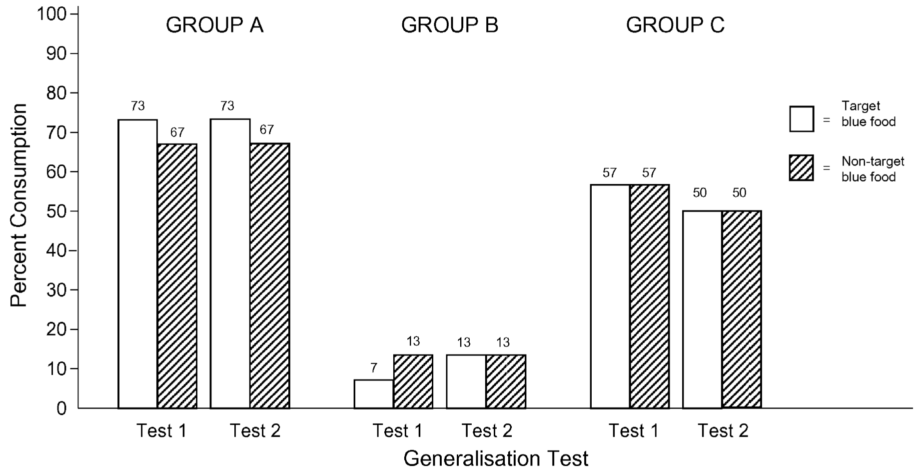

Fig. 4. For each group of 3–4-year-old children, mean percent consumption of target blue food and second blue food in Generalisation Tests 1 and 2.

Statistical analyses: Studies 1 and 2

Whereas there were significant differences in target food consumption between the positive and negative modelling groups in both studies, the differences between the positive modelling and control groups did not reach significance despite a consistent trend in the data. This may have been due to small subject numbers, a possibility that was investigated by combining data over the two studies to test whether positive modelling (Group A) results in greater consumption of the target blue food than presentation in no-modelling conditions (Group C). For Phase 1 of the studies, when all data for Groups A and C were compared, no significant difference was found (Mann–Whitney, $p = .098$). However, the difference between these two groups was significant for the Phase 2 data (Mann–Whitney, $p = .011$).

Discussion

The main finding of Study 2 was that the 3–4-year-old children's consumption of a novel food was affected by peer behaviour, particularly if the peers modelled "dislike" of that food. There was significantly more consumption of the target food in children exposed to the positive peer modelling than to the negative peer modelling, and significantly less consumption of the target food in the children who were exposed to the negative peer modelling intervention than for those who were presented with the food in the absence of peers. Moreover, the mean difference between the consumption of the negative modelling group and the controls was greater than the difference between the positive modelling group and the controls, suggesting that the negative intervention was the more powerful. In addition, the effects of the initial negative intervention in Phase 1 were not reversed by the subsequent positive intervention in Phase 2, suggesting that first experiences with foods are not easily overridden in 3–4-year-old children.

The effects of the interventions generalised to the "alone" context and a different (but similarly coloured) food. Consumption of the second blue food closely mirrored that of the target blue food.

The mean data suggest a rising trend in the effects of the positive intervention over presentations of the target food. Analysis of the Phase 2 data for Studies 1 and 2 combined found that consumption of the blue food was significantly greater in the positive modelling group than in the no-modelling controls. It is possible, therefore, that a third positive intervention might have increased consumption of the food yet further.

General discussion

The results of the present two studies indicate that in children aged from 3 to 7 years negative peer modelling has potent effects on their consumption of novel foods. Both studies also suggest that positive peer influence can increase the likelihood of consumption of a novel food, but more than one exposure to the intervention may be necessary to achieve optimal results. The main divergence between the findings of Studies 1 and 2 is the reversal in Study 1, but not in Study 2, of the negative peer modelling effects on consumption in Group B when the positive peer intervention was subsequently introduced. In Study 1, Group B consumption increased to levels comparable to Group A, both during the positive intervention (Presentation 3) and during the subsequent 'no peer' presentation (Presentation 4). It is notable, however, that the increase in consumption of the target food was accompanied by relatively weak generalisation to the second blue food, although it is possible that a second positive intervention would have promoted generalisation. By contrast, in Study 2, there was no impact of the positive intervention on Group B's consumption. This suggests that food aversions are more difficult to overcome in younger children.

Although there are parallels between our findings and those of previous research, it is difficult to make direct comparisons because of the different outcome measures used and different target foods. We employed consumption as the outcome measure and the foods were novel to the extent that we had devised them. Duncker (1938) used food ranking as an outcome measure, whilst Birch (1980) used preference, choice, and consumption; both used positive peer modelling to affect choice of familiar foods. Stoneman and Brody (1981) used participants' selection of images of familiar foods as an indicator of preference, and two other studies (Hendy, 2002; Hendy & Raudenbush, 2000) used familiar and novel, but commercially available, foods and assessed the impact of their interventions in terms of 'bites'—a measure that did not necessarily entail swallowing.

This study most obviously extends the findings of previous work by examining the impact of negative peer influence on novel food consumption along with developmental differences in its reversal when followed by positive peer modelling. It also shows the generalisation of peer influence to other similarly coloured, but differently textured, foods. The short-term nature of these studies limits the generalisability of the findings: it is not known whether the behaviour of the children would have continued outside the experimental setting, or what effects might have been observed long-term. Nevertheless, the results do highlight the short-term

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potency of peer behaviour in determining whether or not children consume a novel food and the procedures that could be used to ensure consumption of foods not previously encountered.

A further interesting finding was the high levels of initial target food consumption recorded in the control groups relative to the other two groups. In Study 1, the mean consumption of the target food in the control group across the four presentations was 40.8% (range, 36–45), and in Study 2, 55.3% (range, 50–57). Addessi et al. (2005) also found that on average 2–5-year olds ate 4 g (50% of the amount eaten when the experimenter modelled consumption) of a novel food in the mere presence of a familiar adult student teacher. Similarly, other authors (Wardle, Herrera, Cooke, & Gibson, 2003) report that even on the first presentation, 5–7-year-old primary school children ate on average two pieces (3.6 g) of red pepper (a food shown in taste tests with this age group to be "comparatively novel and relatively disliked") in the presence of an experimenter who simply invited each child to eat as many pieces as he or she wished. Taken together with the present studies, these findings suggest that neophobia, the reluctance to eat new foods (Birch & Fischer, 1998), may be less prominent in 2–7-year olds than has been previously thought. In a recent review of the concept of neophobia and its relation to children's age (Dovey, Staples, Gibson, & Halford, 2008) it is reported that studies so far suggest that from low levels in infancy, neophobia rises sharply between 2 and 6 years and then decreases with age.

What is common across these studies is that an experimenter presented the novel food to the child and remained in the room while the child ate as much of it as he or she desired. The presence of an experimenter during these exposures, however, may be a variable in itself and requires separate investigation with appropriate controls. In the present study, for example, the experimenter who offered the foods was one member of a team who were instrumental in providing the children's entertainment throughout the day of the study. When the experimenter offered the foods to the participants, the children may have felt a desire to please and a sense of obligation to try even the strange looking blue foods. Similar demand characteristics (Orne, 1962) may have been operating in other studies and have varied between studies. However, in our studies, whereas the difference between positive peer influence and adult influence was only significant after a second presentation of the positive peer intervention, any effects that may have been due to the adult who presented the foods were eliminated completely by one presentation of negative peer modelling.

In order to maximise peer influence, our studies employed four peer models, and all were older than the target children. However, the impact of the positive intervention was significant only after a second positive intervention, with four more peer models. It would be interesting in future studies to determine the optimal number and kind of positive peer models required to achieve significant behaviour change in the smallest number of presentations of a new food. The impact of the negative intervention on the other hand was strong, even on the first presentation. It would be instructive, therefore, to determine whether a smaller number of peers, or just one, might be sufficient to inhibit consumption to the same extent as occurred in the present studies. Most importantly, the number of positive presentations required to overturn this inhibition, and significantly increase and maintain consumption, needs to be determined. The different outcomes in the negative peer modelling groups over the two studies suggest that developmental differences in these variables also require further investigation.

Some studies have presented just the target foods (e.g., Addessi et al., 2005; Wardle et al., 2003) whereas others, as in the present study, have presented the target foods in the context of familiar foods (e.g., Birch, 1980). It is possible that a novel food presented on its own may be regarded with more caution by the child than a novel food presented on the same table or plate as a selection of familiar foods. Future studies could also investigate whether these food-based- and other contextual variables (such as the mere presence of the experimenter, and experimenter characteristics) play a role in children's acceptance of novel foods.

The present studies employed live models to influence food consumption. However, assembling four peers to encourage young children to consume new foods may not often be feasible. This raises the question of whether televised peer models might also be effective at encouraging behaviour change. The Food Dudes intervention (Horne et al., 2004; Lowe et al., 2004) employs video peer models in combination with contingent rewards to increase children's consumption of fruit and vegetables. Unfortunately, a study of the separate effects of the six-episode Food Dudes video series on children's consumption of novel foods has not yet been conducted. It is clear, however, from studies conducted in schools, that prolonged exposure to fruit and vegetables per se has no impact on children's consumption of these foods (Horne et al., 2004; Horne et al., 2008). Whereas other studies (Harper & Sanders, 1975; Hendy, 1999; Hendy & Raudenbush, 2000) have shown that positive peer modelling can produce food acceptance more effectively than exposure alone, the present study also shows high levels of generalisation of this acceptance to another novel food. A recent study (Williams, Paul, Pizzo, & Riegel, 2008), which used an exposure and contingent verbal praise paradigm (and see Greer, Dorow, Williams, McCorkle, & Asnes, 1991), found that the more novel foods the children learned to eat in the course of rewarded taste exposure trials, the more readily they accepted other new foods. Although in the latter study four of the six children were diagnosed with learning disabilities, it seems likely that a similar "learning to learn" effect (Harlow, 1949) may also occur in normally developing children, for whom peer influence could be harnessed to further increase the pace of this behaviour change. This is particularly important, given that children who witness expressions of disgust towards certain foods by others are likely to be resistant to an intervention that consists of exposure alone, and the present study shows that 3–4-year-old children are particularly vulnerable to such negative influences. Peer-modelling interventions should, therefore, be designed for maximum potency in order to override any already established inhibition to particular foods and immunise the young child from further negative peer influences, so as to ensure that a wide range of foods can be tasted sufficient times for the child to learn to like them.

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