

Parent-Administered Exposure to Increase Children's Vegetable Acceptance: A Randomized Controlled Trial

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ABSTRACT

Background Repeated taste exposure, in combination with small rewards, has been shown to increase children's acceptance of disliked foods. However, previous studies have used direct contact with researchers or professionals for the implementation of the repeated exposure procedure. If mailed taste exposure instructions to parents produced comparable outcomes, this could be a cost-effective and easily disseminable strategy to promote healthier diets in children.

Objective Our randomized controlled study aimed to test the efficacy and acceptability of mailed materials giving instructions on taste exposure as a means of increasing acceptance of vegetables in preschool-aged children.

Design Participants were families of 3-year-old twins from the Gemini cohort who took part between March 2011 and April 2012. Families were randomized to a mailed intervention or a no treatment control condition. The intervention involved offering each child 14 daily tastes of a disliked (target) vegetable with a small reward (a sticker) if the child complied.

Main outcome measures Outcomes were the child's intake of the target vegetable (number of pieces) and parent reports of the child's liking at two baseline (T1 and T2) and one postintervention (T3) behavior assessment.

Results Record sheets with intake and liking data from T1, T2, and T3 were returned for 472 children, of which 442 were complete (94%). Over the intervention period (T2 to T3) intake and liking of the target vegetable increased significantly more in the intervention group than in the control group (intake: odds ratio 12.05, 95% CI 8.05 to 18.03, $P < 0.001$; liking: odds ratio 12.35%, CI 7.97 to 19.12, $P < 0.001$). Acceptability of the procedure was very high among parents who completed the protocol.

Conclusions Mailed instructions for taste exposure were effective in increasing children's acceptance of an initially disliked vegetable. These results support the value of parent-administered exposure to increase children's vegetable acceptance, and suggest that it can be carried out without direct health professional contact.

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VEGETABLES ARE AMONG CHILDREN'S MOST disliked foods,^{1,2} and vegetable intake consistently falls short of dietary guidelines.³⁻⁵ Low consumption of fruits and vegetables is associated with a range of negative health outcomes.^{3,6-8} Food patterns established in early childhood have been shown to track into adulthood⁹⁻¹¹; therefore increasing children's vegetable intake should be a priority for public health.

Early childhood appears to be a sensitive period for development of food preferences.^{12,13} Food neophobia, which is characterized by a rejection of novel foods, is associated with low consumption of fruits and vegetables^{14,15} and limited dietary variety.^{10,16,17} Patterns of food refusal commonly begin around age 2 years. Although rejection of foods such as vegetables is widespread among preschool children,¹⁸⁻²⁰ it is nonetheless a significant cause of anxiety to parents and a common reason for consulting health professionals. Family mealtimes with fussy children can become a source of stress that in turn can negatively affect children's eating behavior.²¹

Food preferences are developed through exposure to specific flavors. People become more familiar with foods the more they taste them, which in turn results in greater liking for these foods over time. This observation underpins a body of research into the effect of repeated exposure on children's food preferences, which has demonstrated that daily taste exposure can increase children's acceptance of unfamiliar or moderately disliked foods.²²⁻²⁴

Several recent studies have extended the repeated exposure protocol by introducing small rewards to encourage children to taste an unfamiliar or disliked food. The first of these studies was conducted with 4- to 6-year-old children in a school setting.²⁵ Children in two reward conditions and in a mere exposure condition increased their acceptance of a vegetable, but after 3 months the effect was only maintained in the reward conditions. A second study built on these findings, investigating the use of the exposure plus rewards protocol in a home setting.²⁶ Families were visited by researchers and given training in the use of exposure with

rewards. Two weeks of parent-administered repeated exposure in combination with a sticker reward was found to be effective in increasing children's vegetable acceptance, and parents were extremely positive about the program.²⁶ Similar results were reported in an Australian study of 4- to 6-year-olds that successfully demonstrated the effectiveness of using a sticker reward combined with a repeated exposure strategy administered by parents in the home.²⁷ These findings suggest the addition of small rewards for tasting as part of the exposure protocol have no adverse effect on outcomes and may help encourage pickier children to comply.²⁸

It has been suggested that rewarding children for tasting a food could backfire, resulting in decreased preference and intake.^{20,29-31} However, a recent review proposes that the effect of rewards might depend on the initial liking of the rewarded food.²⁸ Rewarding consumption of well-liked or palatable foods may result in decreased preference and intake,^{30,32} whereas rewarding consumption of disliked foods, such as vegetables, may encourage tasting without any detrimental effects on preference.²⁶ The studies described above have demonstrated that repeated exposure in conjunction with small rewards can successfully increase children's vegetable acceptance. However, the contact with researchers or health professionals necessary to demonstrate the procedures is expensive and prohibitive of wider dissemination. The positive feedback received from parents participating in the home-based studies, together with the relative ease with which they managed to carry out the exposure-plus-reward procedure, suggested that simply mailing instruction materials to parents, without any researcher input, might hold promise as a cost-effective and easily disseminable intervention.

Therefore, the primary aim of our study was to evaluate the efficacy of a taste exposure-plus-reward intervention delivered through mailed materials and access to an online video. We predicted that parents in the intervention condition would successfully implement the exposure and reward protocol with their children, resulting in increased intake and liking of the target vegetable.

SUBJECTS AND METHODS

Study Design and Sample Size

Using a double pretest, randomized controlled design, we compared a protocol of parent-administered taste exposure sessions with a no-treatment control condition. Outcomes (intake and liking of the target vegetable) were assessed through parent-administered tests at baseline (T1), 14 days later immediately before the intervention period (T2), and 14 days after that, immediately following the intervention period (T3). This design permitted between-group analyses of the treatment effect (T3 controlling for T2), as well as within-group comparisons between the rest phase (T1 to T2) and the experiment phase (T2 to T3). This trial is registered as ISRCTN70302102 with Current Controlled Trials (www.controlled-trials.com).

Participants, Recruitment, and Study Group Allocation

Participants were families with 3- to 4-year-old children from the Gemini study, a cohort of 2,402 families with twins born during 2007 in England and Wales.³³ Currently active families (n=2,321) were sent information about a study to test a

method of increasing children's acceptance of vegetables, and just under half (n=1,006; 43%) expressed interest in taking part. Randomization was at the level of the family stratified by twin zygosity (ie, monozygotic and dizygotic). Ethical approval was granted by the Joint University College London/University College London Hospitals Committee on the Ethics of Human Research.

All families were sent instructions for assessing intake and liking at T1, T2, and T3. Intervention families were also sent information on the exposure protocol (called the tasting game) in a sealed envelope that they were asked to open after they had completed T2. The entire Gemini cohort was sent the intervention materials after the end of the intervention period, to maintain consistency within the sample.

The vegetables used in the study were not provided by the researchers; instead, parents were asked to select a target vegetable themselves that neither twin liked. Parents were given some suggestions of vegetables that are easily available and edible without cooking (eg, carrot, cucumber, and celery), but could select others if these were not suitable. The same target vegetable was used for both twins in the three assessments (all study families) and throughout the experiment phase (intervention families only). Parents were asked to carry out all the study procedures with each child separately to minimize imitation or social facilitation within twin pairs.

Outcome datasheets were returned for 472 children (216 in the intervention group and 256 in the control group); these constituted the sample for analysis. Of the 770 nonparticipating families, 84 formally withdrew (17 said their children had no issues with eating vegetables, 38 had other priorities, and 29 gave no reason).

Intervention

The intervention pack contained an exposure instruction leaflet, progress charts, and stickers. The exposure instructions asked parents to offer the child a single very small piece of their target vegetable every day for 14 days, allowing the child to choose a sticker as a reward if they tried it. They were asked to do this separately with each child and outside mealtimes. The process was described to the child as playing the tasting game. Parents were asked to ensure the child understood that the sticker was a reward for tasting the target vegetable. They were encouraged to record if the daily taste session took place and if the child tried the vegetable on a progress chart. The instructions stressed the importance of repeated exposure, explained the techniques of exposure feeding, and emphasized the need for patience and persistence. Parents were also directed to a website with an online video featuring a researcher demonstrating the intervention procedure: how to offer the target vegetable to the child, what to do if the child accepted or refused the vegetable, and how to record the outcome of the tasting session on the progress chart.

Families assigned to the control group were not sent the tasting game instructions during the study period and did not perform the daily taste exposures, but they were told they would receive information about a technique to help their child to like vegetables after they had completed the three tests and returned their datasheets. Control families were sent the intervention materials on completion of the study.

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