RESEARCH
Original Research

A Randomized Controlled Trial of the Food Dudes Program: Tangible Rewards Are More Effective Than Social Rewards for Increasing Short- and Long-Term Fruit and Vegetable Consumption

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ABSTRACT

Background Despite many health benefits, children do not consume enough fruits and vegetables (F/V). The Food Dudes program increases in-school F/V consumption, but the cost of prizes might be an adoption barrier.

Objective Our aim was to compare the effects of the Food Dudes program when prizes vs praise are used to reward F/V consumption.

Design We conducted a randomized controlled trial with three groups (ie, prize, praise, and control). Schools were randomly assigned to groups while approximately equating the percentage of students qualifying for free or reduced-price lunch. F/V consumption (lunch-tray photos) was assessed twice at pre-intervention and once after phase I, phase II, and at 6 months post-intervention, spanning approximately 11 months overall.

Participants/setting In total, 2,292 students attending six elementary schools participated, with 882, 640, and 770 in the prize, praise, and control groups, respectively.

Intervention The Food Dudes program was implemented over 4.5 months in all but the control schools. Two Food Dudes schools implemented the program with tangible prizes contingent on individual students' F/V consumption (prize group); two schools implemented Food Dudes using teacher praise instead of prizes (praise group). Follow-up data were collected 6 months post-intervention.

Main outcome measure F/V consumption was assessed by digital imaging of lunch trays.

Statistical analysis performed Linear mixed-effects modeling, including sex, grade, and baseline consumption as covariates, was performed.

Results Students attending the Food Dudes schools consumed more F/V than control schools after phase I, with larger differences in prize schools (92% difference) than praise schools (50% difference). After phase II, Food Dudes schools consumed 46% more F/V than control schools, with no difference between prize and praise schools. At 6-month follow-up, only prize schools consumed more F/V than control schools (0.12 cups more per child, 42.9% difference).

Conclusions Social praise proved an inadequate substitute for tangible prizes within the Food Dudes program. Program-related increases in F/V consumption decreased after the intervention, underscoring the need to develop low-cost, long-term interventions to maintain and make habitual consumption of recommended levels of F/V.
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CONSUMING A DIET RICH IN FRUITS AND VEGETABLES (F/V) decreases the risk of developing hypertension, coronary heart disease, some types of cancer, and stroke,[1] yet most children and adolescents do not consume the recommended daily amounts.[2,3] Various types of school-based interventions aimed at increasing children's F/V consumption have been evaluated but have yielded mixed results. Evans and colleagues[4] reported that simply providing F/V produces no lasting improvement in healthy eating, and multicomponent interventions produce the best effects.

One multicomponent intervention that has shown the most consistent increases in children's in-school F/V consumption is the Food Dudes program.[5-8] The Food Dudes program uses role modeling, repeated tasting, and rewards delivered contingent on consumption of a criterion amount

of F/V. Figure 1 shows the baseline and intervention phases of the Food Dudes program, as well as intervention components and the individuals responsible for implementing each component. The Food Dudes program typically increases fruit (27% to 164% increases) and vegetable (32% to 51% increases) consumption during the 4-month intervention period. Two long-term evaluations of Food Dudes have been conducted.[6,9] At a 12-month follow-up, Horne and colleagues[6] showed that consumption of fruits, vegetables, and juice (combined) increased by 73% above baseline levels, and Upton and colleagues[9] reported at the same follow-up interval that F/V consumption fell below baseline levels.

Lowe[10] suggested that poor program implementation fidelity might be responsible for the latter outcomes. That is, if teachers did not implement the Food Dudes program as designed, good long-term outcomes should not be expected. Neither the Horne and colleagues[6] nor the Upton and colleagues[9] studies measured implementation fidelity, but the weak effects of Food Dudes during the implementation phase of the latter study (a modest 14% increase in F/V consumption) offer reason to question their implementation fidelity and to be skeptical that their long-term results are representative of Food Dudes. One rationale for conducting the current study was to evaluate the relationship between fidelity of implementing the Food Dudes program and its long-term effects on F/V consumption.

A second rationale was to evaluate the effects of Food Dudes when the tangible rewards are replaced with social praise from teachers. The cost of tangible rewards may be an adoption barrier to schools, despite concerns about students' healthy eating, so evaluating the efficacy of a less-expensive version of Food Dudes was of interest. One well-controlled study[11] reported that tangible rewards and praise increased vegetable consumption at a 3-month follow-up relative to a control group. Although tangible rewards produced about twice the effect of social praise (not a statistically significant difference), the fact that praise maintained elevated long-term vegetable consumption suggests that this model of rewarding F/V consumption in schools could prove to be a cost-effective approach to improving public health.

A randomized controlled trial was conducted in which incentive type (tangible reward vs praise) was compared with a no-treatment control. Based on previous research, tangible rewards and praise were hypothesized to increase F/V consumption relative to a control condition, with tangible prizes being more effective incentives than praise. A secondary hypothesis was that at follow-up, both incentive groups would consume significantly more F/V than the control group.

METHODS

Participants and Setting

Participant recruitment began in early 2011. All students attending one of six public elementary schools in a single, suburban school district in northern Utah during the 2011/2012 academic year (including those bringing lunch from home) were invited and eligible to participate in all study phases. The district was composed of 49% female students. Approximately 91% of all students were white, 8% were Hispanic/Latino, 8% were American Indian, 1% African American, and 1% Asian (school district records permitted caregivers to select more than one race or ethnicity for each student, thus percentages sum to >100%.). Required sample size was calculated via a power analysis for cluster-randomized designs. A passive, opt-out consent provided to students' parents/guardians yielded a minimum of 92% participation (range=92% to 97%, n=2,292), with 29, 26, and 69 students opting out of participation in the prize, praise, and control groups, respectively. All teachers (n=63) agreed to participate in the implementation fidelity analyses and were assured anonymity. The research protocol, including the passive-

Phase	F/V[a] served	Component (implemented by)[b]
Naturalistic Baseline	Typical school menu/home lunch	None
Default-Provision Baseline	FD[c]-targeted F/V	Default Provision to encourage repeated tasting (researchers)
Phase I	FD-targeted F/V	Default Provision (researchers) FD media to provide role models (teachers) Rewards as F/V consumption incentives (teachers)
Phase II	Typical school menu/home lunch	Wall chart to encourage student self-monitoring (teachers) Rewards (teachers)
Follow-up	Typical school menu/home lunch	None

[a]F/V=fruits and vegetables.

[b]Indicates who implemented the indicated component of the Food Dudes Program.

[c]FD=Food Dudes.

Figure 1. Description of each baseline and intervention phase of the Food Dudes program, including whether the fruits and vegetables (F/V) served were from the typical school-lunch menu or were F/V selections that were served by default to each child and targeted for consumption by the Food Dudes program.