Incentivizing Children’s Fruit and Vegetable Consumption: Results of a United States Pilot-Study of the Food Dudes Program

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We know they are good for us, but few Americans eat the recommended (3.5 cups per day for children 4-13) amounts of fruits and vegetables a day.
School-based interventions demonstrate modest increases in fruit consumption (+ 0.24 portion) and minimal increases in vegetable consumption.
Role modeling
Repeated tasting
Rewards
Rewarding eating behavior is controversial

- Studies in controlled research environments support the “backfiring” model (Birch et al, 1982, 1984) – children liked preferred foods (sweet drinks) less when they were rewarded for consuming them.

- Positive results have emerged from more recent studies in less rigid environments where intake of less preferred foods (vegetables) is the outcome (Kern and Marder, 1996, Orrell-Valente 2007, Wardle 2003, Cooke 2011, Remington 2012, Horne 2004)
Incentives may increase intrinsic motivation for a behavior when...

- Baseline intrinsic motivation is low (Lepper, 1993),

- they encourage sampling something that the individual may like (Bandura, 1986),

- they promote repeated tasting (Cooke et al. 2010),

- they are given in a way that builds confidence & competence (Cameron, 2001).
Baseline Intrinsic Motivation
Objective

- Preliminary evaluation of the implementation of the Food Dudes program in the U.S. school system.

- Repeated tasting of FV was provided to children at lunch instead of in classrooms as a mid-morning snack.
Participants

- Research protocol was reviewed and approved by USU’s IRB. Parent’s of students provided consent for child to participate.

- 1\textsuperscript{st} – 5\textsuperscript{th} graders at one elementary school in Nothern Utah (n=253; >90%)
  - 58% female
  - 87% white
  - 13% had BMI-for-age $> 85\text{th}$ile
  - 22% qualified for free and reduced school lunch
  - 85% participated in school lunch program
<table>
<thead>
<tr>
<th></th>
<th>Naturalistic baseline</th>
<th>Default provisions baseline</th>
<th>Phase 1</th>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>4 days</td>
<td>4 days</td>
<td>16 days</td>
<td>3 months</td>
</tr>
<tr>
<td>Assessment days</td>
<td>4 days</td>
<td>4 days</td>
<td>Last 4 days</td>
<td>Last 4 days</td>
</tr>
<tr>
<td>Lunch time procedure</td>
<td>Usual</td>
<td>Full servings of FD FV placed on child’s tray</td>
<td>Full servings of FD FV placed on child’s tray</td>
<td>Usual</td>
</tr>
<tr>
<td>Height and weight</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Skin carotenoids</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Lunch tray photos</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Baselines

- Naturalistic baseline (4 days) – assessment measures collected, children received usual school lunch

- Default provisions baseline (4 days) – children received default provisions of full servings of 4 FV pairings on their tray with lunch (FD FV)
Baseline assessments

- Digital observations of lunch-time intake
  - 4 days during naturalistic baseline
  - 4 days during default baseline
- Height
- Weight
- Skin carotenoids
Assessment: Digital observations

- Two blinded research assistants estimated to nearest piece or 1/4 cup
- If estimates didn’t match, 3rd blind estimate
- All estimates agreed by 3rd estimate
Skin carotenoid concentrations – a biomarker of fruit and vegetable intake

Levels of carotenoids in blood and tissue (including skin) are known to correlate with dietary carotenoid intake. (Peng et al, Nutr Cancer 1995; Mayne et al. AJCN 2010)
Phase 1 – 16 days

- Children watched FD videos in classroom before lunch; 6 (6-minute long) videos featuring the FDs (heroic tween-agers who eat FV and battle the evil “Junk Punks”)
- Children get their hand stamped in cafeteria when they consume required portion of FD FV (4-5 observers)
- Teachers give students their reward in the classroom after lunch
- Intake measured on last 4 days
- Skin carotenoids assessed
Phase 2 – 3 months

- Lunch as “usual”
- Children get their hand stamped in cafeteria when they consume full portions of F and V (4-5 observers)
- Children/teachers record consumption on a wall chart
- Teachers provide rewards intermittently (2, 4, 6, 8, 5, 7, 8, 8, 12)
- Intake measured on last 4 days
- Height, weight, and skin carotenoids assessed
Statistical analyses

- The distributions of FV intake were not normally distributed – skewed with 0s.
- Exact statistical tests were used to examine differences in intake across time points
  - Naturalistic baseline vs. phase 2
  - Default baseline vs. phase 1
- GLM repeated measures were used to examine differences in skin carotenoid scores
Results – default provisions baseline vs. end of phase 1

P < 0.0001

P < 0.0001

Cups of FD F/V Consumed

Fruit

Vegetable

Default Baseline

Phase 1

*
Results – naturalistic baseline vs. end of phase 2

P = 0.015

P = 0.002
Change in FV intake was observed among children who ate NONE at baseline.

Table 1. Total mean (standard deviation) fruit and vegetable intake in cups. Children are separated into columns by fruit and vegetable consumption status during the naturalistic baseline; n=253.

<table>
<thead>
<tr>
<th></th>
<th>Consumed no fruit or vegetable at baseline&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Consumed some fruit or vegetable at baseline</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vegetables (n=119)</td>
<td>Fruit (n=100)</td>
<td>Vegetables (n=134)</td>
<td>Fruit (n=153)</td>
</tr>
<tr>
<td>Naturalistic Baseline&lt;sup&gt;a&lt;/sup&gt; (n=255)</td>
<td>0</td>
<td>0</td>
<td>0.40 (0.25)</td>
<td>0.43 (0.25)</td>
</tr>
<tr>
<td>Default-Provision Baseline&lt;sup&gt;c&lt;/sup&gt; (n=253)</td>
<td>0.15 (0.15)</td>
<td>0.32 (0.22)</td>
<td>0.22 (0.18)</td>
<td>0.46 (0.19)</td>
</tr>
<tr>
<td>Intervention, Phase 1&lt;sup&gt;d&lt;/sup&gt; (n=254)</td>
<td>0.29 (0.19)*</td>
<td>0.44 (0.29)*</td>
<td>0.40 (0.23)*</td>
<td>0.65 (0.28)*</td>
</tr>
<tr>
<td>Intervention, Phase 2&lt;sup&gt;f&lt;/sup&gt; (n=255)</td>
<td>0.22 (0.22)**</td>
<td>0.27 (0.35)**</td>
<td>0.36 (0.30)</td>
<td>0.43 (0.39)</td>
</tr>
</tbody>
</table>
Results - skin carotenoids

P = 0.001
Consumer Satisfaction

- 42% of parents (n= 108)
- 75% agreed children ate more FV at school
- 60% agreed children ate more FV at home
- 70% agreed they would recommend to another school

- 80% of teachers (n=16)
- 80% of teachers said children enjoyed the program
- 75% said they would recommend to another school
Discussion

- FD worked in short term – worked best for those who ate NO FV at baseline (39%, 47% for FV, respectively) → intake increased from 0 to 0.49 cups per day.
- Tangible incentives did not erode intrinsic incentives to consume FV – even among those who had high intrinsic value to consume FV in the beginning.
- The long term efficacy has not been examined, the translation into behavior outside of school has not been examined.
- This was not an experimental design.
Implications

- A model that includes role models, and rewards to encourage repeated tasting experiences may be a successful strategy to help US children develop healthy eating habits.
Things we are working on/interested in

- Currently running an experimental trial (6 schools)
- Fidelity measures utilizing a web-based tool
  - Does teacher fidelity impact outcome?
- Assessments of total diet
  - If children consume more FV at school, do they consume more FV at home, and do they consume less “junk food” at school and at home?
- “Gamification”
  - Reward is progression of a story instead of tangible rewards
  - This model is less costly and less burdensome for teachers.
- Longer-term follow-up
  - Do children maintain the behavior even when they graduate from primary school?
Contact information

- Heidi Wengreen, 435-797-1806 (phone), heidi.wengreen@USU.EDU

- Food Dudes, Fergus Lowe, creator of the Food Dudes program, 44-124-838-2210 (phone)
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