Development and Validation of a Questionnaire to Assess Fruit and Vegetable Consumption at School Lunch

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SNEB Annual Conference
July 21, 2017
Disclosure

• This study was funded by FoodCorps, Inc.
• The speaker is currently employed by Chobani, LLC

• All other authors have no conflicts of interest to declare
Children consume too few fruits and vegetables (FV)

- Fewer than 1 in 10 meet federal recommendations for daily FV consumption\(^1\)
  
- Schools meal and snack programs are an opportunity to encourage FV consumption
  - Up to 50% of daily calories are consumed here\(^2\)

- Valid, practical instruments are needed to assess the effectiveness of these programs\(^3\)

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1. 2015-2020 Dietary Guidelines for Americans
Dietary assessment in the school lunch context

- Weighed plate waste, digital photography, and direct observations are widely used
  - Cost $0.92, $0.62 and $0.62 per observation\(^1\), respectively

- Self-report methods offer several advantages, yet few validated instruments exist

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Population</th>
<th>Percent Agreement</th>
</tr>
</thead>
</table>
| Day in the Life Questionnaire\(^2\) | 4\(^{\text{th}}\) – 5\(^{\text{th}}\) grade | • 87-88% items on tray  
  • 47% amounts eaten |
| School Lunch Recall Questionnaire\(^3\) | 3\(^{\text{rd}}\) – 5\(^{\text{th}}\) grade | • 84% items on tray  
  • 0.63 serving inaccuracy |

\(^1\) Kenney et al. *J Acad Nutr Diet.* 2015  
\(^2\) Wallen et al.. *J Nutr Educ Behav.* 2011  
\(^3\) Paxton et al. *J Acad Nutr Diet.* 2011
Objective

• Develop and validate a group-administered, paper-and-pencil questionnaire to assess FV consumption during lunch among 2nd and 3rd grade students participating in the NSLP
Methods

• 5 phase study conducted between May and June 2016

• 2nd and 3rd grade students
  – Phase 1-4: Convenience sample (n=3 schools)
  – Phase 5: FoodCorps sample (n=20 schools)

• Comparison between two dietary assessment methods
  – Questionnaire and digital photography
Digital photography

- Cameras placed on tripods at 60-degree angle
- Before- and after-meal photography protocol
- IRR: 99% for on tray; 83% for amount consumed

1. Swanson et al., 2008
2. Taylor et al., 2014
Fruit and Vegetable Recall Questionnaire (FVRQ)

Wristband Number __________________________

Fruit 1: __________________________

Did you have it on your tray?
☐ No
☐ Yes

How much of it did you eat?
☐ None
☐ A little
☐ Half or most
☐ All

How much did you like it?
☐ I didn’t eat any
☐ I didn’t like it 😞
☐ It was okay 😐
☐ I liked it 😊

Would you eat it next time at school lunch?
☐ No
☐ Maybe
☐ Yes

If your lunch tray looked like this…

How much did you eat?
☐ Ate none
☐ Ate a little
☐ Ate half or most
☐ Ate all

Laurie M. Tisch Center for Food, Education & Policy
Refinement of the questionnaire

PHASES 4-5
Data analysis

• Photo and questionnaire data matched to create “sets”

• Percent agreement
  – **Items on tray:** match, omission or intrusion
  – **Amount eaten:** match, overestimation, underestimation

• ICC for amount eaten between methods
• Pearson correlations between questionnaire items
## Descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School</strong></td>
<td>School A</td>
<td>School B</td>
<td>School B</td>
<td>School C</td>
<td>Schools D-W</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>2nd grade</td>
<td>2nd grade</td>
<td>2nd grade</td>
<td>2nd grade</td>
<td>2nd-3rd grade</td>
</tr>
<tr>
<td>“Sets”</td>
<td>n=36</td>
<td>n=50</td>
<td>n=60</td>
<td>n=44</td>
<td>n=976</td>
</tr>
</tbody>
</table>

### School-level data

- **Male (%)**
  - School A: 53.5
  - School B: 49.1
  - School C: 49.1
  - Schools D-W: 49.5
  - Overall: 51.4 (SD=3.4)

- **FRPL (%)**
  - School A: 100.0
  - School B: 89.4
  - School C: 89.4
  - Schools D-W: 49.8
  - Overall: 74.6 (SD=21.1)

- **Black (%)**
  - School A: 30.1
  - School B: 70.0
  - School C: 70.0
  - Schools D-W: 13.2
  - Overall: 40.1 (SD=32.0)

- **Hisp. (%)**
  - School A: 61.6
  - School B: 96.5
  - School C: 96.5
  - Schools D-W: 42.2
  - Overall: 22.1 (SD=28.2)

- **White (%)**
  - School A: 3.8
  - School B: 2.4
  - School C: 2.4
  - Schools D-W: 37.9
  - Overall: 29.4 (SD=33.9)

- **Salad bar**
  - School A: No
  - School B: No
  - School C: No
  - Schools D-W: Yes
  - Overall: 40% (n=8)

Graziose et al. *In review.*
### Good agreement between questionnaire and photographs

<table>
<thead>
<tr>
<th>Phase</th>
<th>Item Type</th>
<th>Item on Tray</th>
<th>Amount Eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Fruit</td>
<td>78</td>
<td>61</td>
</tr>
<tr>
<td>(n=36 sets)</td>
<td>Vegetables</td>
<td>86</td>
<td>74</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Fruit</td>
<td>84</td>
<td>65</td>
</tr>
<tr>
<td>(n=50 sets)</td>
<td>Vegetables</td>
<td>86</td>
<td>64</td>
</tr>
<tr>
<td>Phase 3</td>
<td>Fruit</td>
<td>90</td>
<td>86</td>
</tr>
<tr>
<td>(n=60 sets)</td>
<td>Vegetables</td>
<td>97</td>
<td>73</td>
</tr>
<tr>
<td>Phase 4</td>
<td>Fruit</td>
<td>92</td>
<td>81</td>
</tr>
<tr>
<td>(n=44 sets)</td>
<td>Vegetables</td>
<td>94</td>
<td>86</td>
</tr>
<tr>
<td>Phase 5</td>
<td>Fruit</td>
<td>88</td>
<td>73</td>
</tr>
<tr>
<td>(n=976 sets)</td>
<td>Vegetables</td>
<td>89</td>
<td>78</td>
</tr>
</tbody>
</table>

Graziose et al. In review.
Quantitative estimates of amounts eaten

- Good agreement (ICC>0.60) observed between methods for estimates of amount consumed (in cup equivalents)

<table>
<thead>
<tr>
<th></th>
<th>Total Items</th>
<th>Intra-class Correlation Coefficient (ICC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>2,188</td>
<td>0.635</td>
</tr>
<tr>
<td>Fruit</td>
<td>1,810</td>
<td>0.605</td>
</tr>
</tbody>
</table>
Construct validity

- Excellent and moderate correlations among items linked by behavioral theory

<table>
<thead>
<tr>
<th></th>
<th>Amount Eaten</th>
<th>Preference</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fruit (n=1,810 items)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount eaten</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preference</td>
<td>0.893 **</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Intention</td>
<td>0.484 **</td>
<td>0.503 **</td>
<td>1</td>
</tr>
<tr>
<td><strong>Vegetables (n=2,188 items)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount Eaten</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preference</td>
<td>0.912 **</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Intention</td>
<td>0.555 **</td>
<td>0.574 **</td>
<td>1</td>
</tr>
</tbody>
</table>

Excellent and moderate correlations among items linked by behavioral theory by Graziose et al. In review.
Conclusions

• FVRQ is valid for measuring FV consumption at school lunch among 2\textsuperscript{nd} and 3\textsuperscript{rd} grade students

• Researchers can use this self-report instrument in lieu of costly objective methods

• Future research should examine the sensitivity of the instrument prior to use in an evaluation setting
Thank you!

- **Co-authors:** Pam Koch, Randi Wolf, Isobel Contento, Heewon Gray
- **Collaborators:** Raynika Trent, Elizabeth Tipton, Ian Ang, Amanda Kelly, Kasey Wien, Colleen Topper, Erica Oliner, Camille Veri
- **FoodCorps:** Eva Ringstrom, Ryan Ames, FoodCorps service members
- **Data collection volunteers**
- **Schools, staff, parents, and students who participated in this study**