Assessing a Food Safety Behavior Questionnaire for Criterion Validity

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Introduction

• Food safety education programs generally rely on self-reported behavioral questions administered pre and post education to measure program impact.

• Observational studies indicate that errors in food handling are more common than reported on questionnaires (Jay et al. 1999; Anderson et al., 2000)
Purpose

• Develop a validated bank of food safety behavior questions that could be used with confidence when evaluating consumer education programs.

• Determine if self-reported behaviors can be a valid way to assess behavioral outcomes of food safety education programs among low-income groups.

Medeiros, Hillers, Kendall 1999-2001
UDSA grant #99-35201-8126

Development of Behavioral Questions

• Sub-group (n=8) from Expert Panel developed behavioral questions for each of 29 behaviors identified by Expert Panel as being important in reducing risk of foodborne illness in the home.

• First draft reviewed for content and face validity by tri-state team, faculty in three states, and 2 groups from target audience.

• Questionnaire revised and shortened based on feedback received.
**Question Bank**

- Question Bank to be tested for reliability and validity contained 52 behavior questions:
  - Practice personal hygiene (5 questions)
  - Cook foods adequately (12)
  - Avoid cross contamination (7)
  - Keep foods at safe temperatures (12)
  - Avoid foods from unsafe sources (16)

**Questionnaire**

- Two part questionnaire addressed food safety issues for the general public and those specific to pregnant women
- Contained a variety of question types:
  - 5 point Likert scale (20 questions)
  - Dichotomous Y/N (41)
  - Multiple choice (1)
Reliability Testing

• Test/retest:
  – Target audience members (n=20) took questionnaire at 2 time points; responses correlated and compared via paired t-tests
  – Questions considered reliable if:
    ✓ P-value > 0.05 & r ≥ 0.70 or Agreements/Agreements +Disagreements ≥ 70%

• Internal consistency:
  – Assessed using Cronbach alpha; run on all items within a particular construct
  – Questions with α ≥ 0.60 considered internally consistent (Osterhof, 2001; Taylor et al., 2001; Murphy et al., 2001)

Reliability Results

• Test/Retest:
  – 47 of 52 questions met reliability criteria

• Internal consistency:
  
<table>
<thead>
<tr>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Hygiene:</td>
</tr>
<tr>
<td>Cook Foods Adequately:</td>
</tr>
<tr>
<td>Avoid Cross-contamination:</td>
</tr>
<tr>
<td>Keep Foods at Safe Temperatures:</td>
</tr>
<tr>
<td>Avoid Unsafe Foods:</td>
</tr>
</tbody>
</table>
Validity

• Degree to which an instrument measures what it is intended to measure

• Assessed several types of validity:
  – Content Validity: Reflects domain of content to be measured
  – Face Validity: Measures what intended to measure
  – Criterion Validity: Correlates with other more accurate instrument

Validity Testing

• Criterion Validity – focus of this study.

• Established by comparing questionnaire response to observed behavior and interview responses during a kitchen activity session held ~ one week later.
Validation Study Subjects

- 70 FSNEP and EFNEP participants in CO, WA, and OH
  - 50 post education only
  - 20 pre and post education
- Primary food preparers
- Had completed an education program that included a 30- to 60-minute food safety component

Study Design  Post-Education

<table>
<thead>
<tr>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6 to 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Safety Class</td>
<td>Take Questionnaire -Recruit-</td>
<td>Observation + Interview Session</td>
</tr>
</tbody>
</table>
Study Design  Pre-Post Education

<table>
<thead>
<tr>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruit &amp; Take questionnaire</td>
<td>Observation &amp; Interview session</td>
<td>Food Safety Class</td>
<td>Take Questionnaire</td>
<td>Observation &amp; Interview session</td>
</tr>
</tbody>
</table>

Kitchen Activity Session

• Cooking Observation in Community Kitchen:
  – Cook a chicken breast to desired doneness
  – Slice an apple to garnish the chicken
  – Cook a hamburger to desired doneness
  – Slice a tomato to go with the hamburger

• In-depth interview
  – Asked the same questions on the questionnaire in a conversational, open-ended manner
Kitchen Activity Protocols

- Extensive training of research assistants on conducting cooking observations and interview sessions. Mock interviews conducted & videotaped.
- Two research assistants conducted each session (safety reasons).
- Each subject provided with same food items, utensils, equipment, instructions.
- Cooking sessions videotaped and interviews audio-taped.
- Actions and responses coded by research assistant who conducted session, then re-coded by one researcher in Colorado and responses compared to ensure comparability of data. Differences in coding reviewed by 3rd party and resolved.

Limitations

- Non-randomized design
- Observations not performed in homes
  - No interruptions
  - Subjects could focus on food preparation/cooking
- Intervention for pre/post design wasn’t controlled
Validation Design

% Agreement*

Behavioral Questionnaire 
Face-to-face Interview 
Observation

*Validation criteria:
  - Observable behaviors: ≥70 % agreement among all 3 instruments (counting correct & incorrect behaviors)
  - Non-observable behaviors: ≥70 % agreement between questionnaire & interview

Validity Results

• Observable Questions:
  – 54.5% (6 of 11) met validity criteria

• Non-observable Questions:
  – 66% (27 of 41) met validity criteria
### Validity Results

<table>
<thead>
<tr>
<th>Control factor</th>
<th># of valid questions</th>
<th># of invalid questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal hygiene</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Cook foods adequately</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Cross-contamination</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Safe temperatures</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Avoid foods</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Total questionnaire</td>
<td>33</td>
<td>19</td>
</tr>
</tbody>
</table>

### Instrument Sensitivity

- Potential ceiling effect:
  - Good questions are those that capture range of responses
  - Looked for questions that 20-80% gave less desirable response at pre education
- Change in mean scores from pre to post education (n=20)

(Parmenter and Wardle, JNE 32:269; 2000)
**Instrument Sensitivity Results**

- Among validated questions, several in 4 of 5 control factors showed good response variety pre-workshop, with room for change.
- Pre and post scores on Cross-contamination questions generally high, but improvements needed in skill level.
- Improvements in behavior pre to post seen for washing hands prior to cooking and not leaving meat on counter.

**Conclusions**

- 33 of 52 behavioral questions met reliability and validity criteria (≥70% agreement), including several questions from each pathogen control factor.
- Agreement between observed and self-reported behaviors was better when incorrectly performed behaviors were included.
- Further study is needed using these questions in educational settings with controlled interventions.
Thank You!