Psychosocial Measures Used to Assess the Effectiveness of School-Based Nutrition Education Programs: Review and Analysis of Self-report Instruments for Children 8 to 12 Years Old

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Upon completion of this webinar, you should be able to:

- Explain the importance of program evaluation and measurement of school-based nutrition education programs.
- Describe how evaluation instruments for school-based nutrition education programs are developed and tested to ensure validity and reliability.
- Compare the psychometric properties of evaluation instruments that measure mediators of behaviors in school-aged children.
- List ways in which nutrition education programs can improve their outcome evaluation processes, including the selection of measures and data collection tools.
Why do We Need to Evaluate School-Based Nutrition Education Programs?
Rationale for Evaluation

(summary)

America Wake up...We have a Serious Problem!
Childhood obesity is a serious public health problem in the US and effective changes need to be made immediately!

Potential Solutions to Combat this Problem:

Implementing quality school-based nutrition education interventions that promote healthy eating and physical activity.

How to obtain quality?... Literature suggests that quality school-based nutrition education programs have 2 components:

They must be behaviorally focused.

They must include theory-driven strategies.

One more component: comprehensive evaluation methods/measure.
According to the IOM, the evaluation of childhood obesity prevention interventions is...

... a research priority to understand how best to achieve changes in children’s diet, physical activity and weight.

Increasingly, stakeholders (i.e funding sources) are interested in the results of the evaluation...

...for accountability purposes and for making important decisions about the program (s) (i.e budget cuts, quality improvement).
Measures=
Foundation of Evaluation

Measures must be:
• Theory-based
• Valid
• Reliable
Four Core Concepts of Questionnaire/Scale Development

- Theory-based: means relating theoretical constructs of the intervention to evaluation measures.

- Validity: means that we measure what we want to measure—accuracy
  - Content Validity (Type 1); Criterion/Predictive Validity (Type 2); Construct validity (Type 2)

- Reliability: means the consistency or repeatability of the measure.
  - Test-retest reliability; Internal consistency
Other Systematic Reviews of Evaluation Measures used in Nutrition Education

**Contento, Randell & Bash., 2002.**

**Conclusion:** Concluded that overall, nutrition evaluation measures and reported in the literature between 1980 and 1999 had significant limitations.

- Rigorous psychometric properties were not frequently reported.
- Scope of the measures was often mismatched with the program’s purpose, duration and power of the intervention
- Sample sizes were often not large enough either to report validity and reliability by ethnicity and other factors.

**Implications:** Further work is needed to develop and test evaluation instruments. “... Once they are appropriate and have adequate psychometric properties... We will then be better able to make judgements about the effectiveness of nutrition education...”
Research Purpose
Research Purpose

To identify and describe self-report instruments that assess psychosocial measures related to dietary behaviors in school-aged children 8 to 12 years old.

To assess the psychometric properties reported for such evaluation instruments.

Psychometric properties: content, construction, development, reliability and validity of these instruments.

Source: Hernández-Garbanzo Y; Brosh J; Serrano E; Cason K; Bhattarai, R. Psychosocial Measures Used to Assess the Effectiveness of School-Based Nutrition Education Programs: Review and Analysis of Self-report Instruments for Children 8 to 12 Years Old. J Nutr Ed Behav 2013; 45 (5): 392-403
Research Question?

- Which are the methodological practices and quality of psychometric studies that aim to design and/or validate self-report instruments for the evaluation of school-based nutrition education programs?
Research Design & Methods
Research Design:

- Systematic review of all available studies on the psychometric properties of all evaluation instruments that aim to measure mediators of dietary behaviors in school-age children, particularly from 8 to 12 years old.
Research Methods

- Definition of Key Terms
- Inclusion & Exclusion Criteria
- Study Selection
- Search Strategy
- Systematic Review
- Data extraction
Search Strategy:

- Search of relevant electronic databases.
- Reference lists/citations of selected studies.
- Relevant published reviews.

Databases Included:

- Ebsco
- PubMed
- Google Scholar
- Web of Knowledge

Period covered: 1999-2010
Definition of Key Terms

Search Strategy:

Search terms:


Combination of search terms followed the same order:

1. Study population terms (i.e. children)
2. Intervention terms (i.e. nutrition)
3. Psychometric terms (i.e. validity)
4. Theory-based terms (i.e. psychosocial constructs)
Inclusion/Exclusion Criteria

**Inclusion Criteria:**

- Published in peer review journal
- Designed for outcome evaluation
- Assess psychosocial measures of dietary behaviors for children ages 8-12 years old
- Written in English
- Paper-pencil self-report
- Reported psychometric properties

**Exclusion Criteria:**

- Instruments used for descriptive studies of correlates of dietary intake.
- Instruments used for evaluation of overweight/obesity treatments.
- Instruments used for clinical studies.
- Instruments used for physical activity interventions.
Study Selection

Initial Search (N=9810)

Scanned Titles for Relevancy & Duplicates (n=189)

Apply Inclusion/Exclusion Criteria to Full-Text Articles (n=62)

Articles Included in the Review (n=20 articles)

Final Sample (n=15 evaluation instruments)
## First Phase of Data Extraction

### Name of Instrument/Program
- Example:
  - KAB questionnaire/Pathways Program

### Conceptualization
- Selected Outcome Measures
- Theory-based
- Curriculum-Based
- New, Adapted or Both

### Construction
- Topics Covered
- # of items
- Response Options
- Completion time

Methodological procedures implemented for developing the instruments.
### Table 1. Conceptualization and Construction Characteristics of Instruments Used to Evaluate the Effectiveness of Nutrition Education Programs in School-aged Children

<table>
<thead>
<tr>
<th>Name of Instrument/ Program</th>
<th>Selected Outcome Measures</th>
<th>Theoretical Framework</th>
<th>New, Adapted, or Both</th>
<th>Topics Covered</th>
<th>Items, n</th>
<th>Response Options</th>
<th>Completion Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>After School Student</td>
<td>Previous dietary intake, sedentary lifestyle and participation in sports activity,</td>
<td>SCT</td>
<td>Yes</td>
<td>Behaviorally focused; low-fat and low-sodium foods/physical activity</td>
<td>56</td>
<td>Multiple choice/likert scale/5-point scale</td>
<td>NR</td>
</tr>
<tr>
<td>Student Questionnaire/CATCH</td>
<td>Dietary knowledge, dietary intake intentions, self-efficacy for healthy food and for</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Kids Club†,<strong>‡,</strong>††</td>
<td>physical activity, self-efficacy, social support, barriers, self-perception, Dietary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge, Attitudes,</td>
<td>knowledge, self-efficacy, social support, intentions, food frequency, weight-</td>
<td></td>
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<tr>
<td>Behaviors Questionnaire/</td>
<td>related attitudes, cultural identity</td>
<td></td>
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<tr>
<td>Pathways†,<strong>‡,</strong>††</td>
<td></td>
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</tr>
<tr>
<td>Kids Kitchen/California</td>
<td>Nutrition and food safety knowledge, food selection and preparation skills and food</td>
<td>NR</td>
<td>Yes</td>
<td>General nutrition (e.g., variety of foods, food selection, food preparation,</td>
<td>10</td>
<td>Multiple choice/3-point scale</td>
<td>30-60 min</td>
</tr>
<tr>
<td>Expanded Food and Nutrition</td>
<td>safety practices</td>
<td></td>
<td></td>
<td>and safety skills)</td>
<td></td>
<td></td>
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<tr>
<td>Program—Eating Right Is</td>
<td></td>
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<tr>
<td>Basic†,<strong>‡,</strong>††</td>
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</tr>
<tr>
<td>Nutrition Knowledge,</td>
<td>Nutrition knowledge, attitudes, and practices.</td>
<td>NR</td>
<td>NR</td>
<td>General nutrition (e.g., Food Guide Pyramid 6 breakfast, fast foods, healthy</td>
<td>44</td>
<td>Multiple choice/3-point scale</td>
<td>30-60 min</td>
</tr>
<tr>
<td>Attitudes and Practices</td>
<td></td>
<td></td>
<td></td>
<td>snacks, high-salt foods, high-sugar foods, high-fiber foods, calcium,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire/Healthy</td>
<td></td>
<td></td>
<td></td>
<td>nutrients, grains, v)</td>
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<td></td>
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<tr>
<td>Lifestyle in Children†,<strong>‡,</strong></td>
<td></td>
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</tr>
<tr>
<td>Questionnaire/Pro Children</td>
<td>Self-rated for F&amp;B intake, knowledge, attitudes, liking, subjective norm, parental</td>
<td>SCT, TTM, TBP</td>
<td>NR</td>
<td>Behaviorally focused: F&amp;B</td>
<td>104</td>
<td>3-point scale/4-point scale</td>
<td>NR</td>
</tr>
<tr>
<td>Project†,<strong>‡,</strong>††</td>
<td>encouragement, self-efficacy, intention, habit, preferences, family rules, availability</td>
<td></td>
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</tr>
</tbody>
</table>

Methodological procedures implemented for developing the instruments.
Data Extraction

Second Phase of Data Extraction

**Reliability Assessment**
- **Internal Consistency**
  - Cronbach $\alpha$
- **Test-retest reliability**
  - Intra-class correlation (ICC)
  - K statistics
  - Pearson/Spearman correlation

**Validity Assessment**
- **Type 1**
  - Content validity
  - Face validity
- **Type 2**
  - Convergent validity
  - Construct validity
  - Predictive validity
  - Concurrent validity
  - Factor analysis

**Scope of Pilot-Testing**
- Cognitive Interviews

Methodological procedures implemented for testing validity & reliability of the instruments.
<table>
<thead>
<tr>
<th>Name of Instrument/Program</th>
<th>Reliability Assessment</th>
<th>Validity Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After School Student Questionnaire/CATCH Kids Club</strong>&lt;sup&gt;13,14&lt;/sup&gt;</td>
<td>Cronbach α&lt;br&gt;NR&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Test-Retest Reliability&lt;br&gt;NR&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Knowledge, Attitudes, and Behaviors Questionnaire/Pathways&lt;sup&gt;15,16&lt;/sup&gt;</td>
<td>Subscales: Diet self-efficacy, diet intentions, attitudes toward attempts at weight loss</td>
<td>Subscales: Body image attitudes, diet intentions</td>
</tr>
<tr>
<td><strong>Kids Kartoon/California Expanded Food and Nutrition Education Program—Eating Right Is Basic</strong>&lt;sup&gt;26&lt;/sup&gt;</td>
<td>Instrument as a whole</td>
<td>NR</td>
</tr>
<tr>
<td>Nutrition Knowledge, Attitudes and Practices questionnaire/Healthy Lifestyle in Children&lt;sup&gt;29&lt;/sup&gt;</td>
<td>Subscale: nutrition knowledge</td>
<td>NR</td>
</tr>
<tr>
<td>Questionnaire to measure personal, social, and environmental correlates with F&amp;V intake/Pro Children Project&lt;sup&gt;17&lt;/sup&gt;</td>
<td>Subscales: F&amp;V self-rated intake, F&amp;V attitudes, F&amp;V active parental encouragement, V perceived barriers, V subjective norm, F availability at home, F knowledge</td>
<td>Subscales: F&amp;V self-rated intake, V knowledge, F attitudes, F&amp;V liking, F&amp;V subjective norm, F&amp;V parental encouragement, V self-efficacy, F&amp;V intention, F&amp;V habit, F&amp;V preferences, F&amp;V availability away from home, F&amp;V perceived barriers</td>
</tr>
<tr>
<td>Measures of Psychosocial Constructs Associated With Adolescents’ Calcium Intake/Adequate Calcium Today Study&lt;sup&gt;18&lt;/sup&gt;</td>
<td>Subscales: attitudes and preference factor, social and environmental factor, knowledge factor</td>
<td>Subscales: attitudes and preference factor, social and environmental factor</td>
</tr>
</tbody>
</table>
Data Extraction

Third Phase of Data Extraction

Methodological procedures in terms of sample size used & general characteristics of the samples used.

General Characteristics of the Participants

- Sample size
- Age or Grade
- Gender
- Socioeconomic status
- Ethnicity

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>Country</th>
<th>Participant Age or Grade</th>
<th>Participant Ethnicity/Gender/Socioeconomic Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR</td>
<td>US</td>
<td>Third to fifth grades</td>
<td>White, Hispanic, African-American/both/NR</td>
</tr>
<tr>
<td>516</td>
<td>US</td>
<td>Third to fifth grades</td>
<td>American Indian/both/NR</td>
</tr>
<tr>
<td>120</td>
<td>US</td>
<td>9- to 11-y-olds</td>
<td>None specified/both/low-income</td>
</tr>
<tr>
<td>335</td>
<td>Malaysia</td>
<td>8-y-olds</td>
<td>Malay, Chinoso, Indian/both/NR</td>
</tr>
<tr>
<td>326</td>
<td>Belgium, Denmark, Norway, Portugal, Spain</td>
<td>10- to 11-y-olds</td>
<td>None specified/both/NR</td>
</tr>
<tr>
<td>206</td>
<td>US</td>
<td>11- to 14-y-olds</td>
<td>White, Asian-American, Native Hawaiian, Pacific Islander/girls/NR</td>
</tr>
</tbody>
</table>
Results

Methodological Practices to Develop the Identified Instruments

Methodological Practices to Test the Identified Instruments
14 of the 20 studies reported designing evaluation instruments based on behavioral theories.

Social Cognitive Theory was the most commonly used theoretical framework (n=9).

Knowledge (n=12) and Self-efficacy (n=11) were the most frequently used measures.

*Did the authors give a description of the theories & measures used to develop their instruments?
The majority of the instruments (n=12) included measures that focus on specific nutrition related behaviors (i.e. whole grains) rather than general nutrition.

Psychosocial measures related to fruits & vegetables were the common targets of most of the reviewed instruments.

Only 3 studies reported if they included items/scales that were curriculum specific content.

*Did the authors give a description of the contents/topics used to develop their instruments?
Most studies either developed new items (n=6) or included a combination of new items with items found in the literature (n=5).

Most of the instruments included over 40 items (n=8) and several types of response options.

Response options most frequently employed were: multiple choice (n=10); and 3- & 4- point ordinal scales (n=10)

Completion time was not frequently reported ~ at least 20 min.

*Was the construction of the instruments/questionnaires explained?
The majority of the studies provided a detailed description of the following sample characteristics: age/grade, gender, ethnicity. The variable - socioeconomic status was not very often reported.

*Did the authors give a detailed description of the sample of subjects used to perform the testing of the instruments?
Participants Characteristics

Most of the reviewed instruments (n=9) were intended with use for 3rd to 6th graders, or 8-11 years old.

Seven instruments were tested with ethnic groups other than non-Hispanic whites.

Four studies reported that they tested their instruments with low-income participants.

Overall, less than half of the instruments were tested with ethnically diverse, low-income samples.

*Did the authors give a detailed description of the sample of subjects used to perform the testing of the instruments?
Eight instruments were tested for content validity through expert reviews.

Nine instruments were pilot-tested with the targeted audience through cognitive interviews.

**Seven instruments were tested or had established type 2 validity (more rigorous types of validity: factor analysis, predictive validity)**

*Did the authors give a detailed description of the procedures used for testing content and/or face validity?
Reliability

*Did the authors give a detailed description of the procedures used for testing reliability?

♦ Note: We only reviewed those studies that reported acceptable internal consistency (Cronbach alfa ≥ 0.6) and test-retest reliability (r ≥ 0.6)

♦ The majority of the instruments had several scales with adequate level of internal consistency (n=13) and test-retest reliability (n=9).

♦ Acceptable levels of internal consistency were most commonly reported for attitudes (n=5) and self-efficacy scales (n=7).

♦ Acceptable levels of test-retest reliability were most commonly reported for attitudes (n=5) and self-efficacy scales (n=3).
Discussion
Discussion

Regarding our first aim, we identified 15 different instruments in 20 studies that met our research criteria.

These instruments were developed for school-based interventions to evaluate psychosocial measures related to general nutrition and/or to specific dietary behaviors in children ages 8-12 years old.

Few of these instruments were tested with rigorous psychometric procedures.

The majority of the studies reviewed were investigated in a limited number of ethnic and low-income socioeconomic groups.
Our second aim, was to assess the instruments’ psychometric properties and the methodological practices used on their respective studies in order to have a better understanding of the reported validity and reliability.

By using the extraction/tabulation methods of this systematic review, we provided a clear overview of the psychometric properties and methodological practices used by the reviewed studies.

The most important strengths and weaknesses are described as follows....
Strengths of Studies

- It was encouraging to see that most of the studies used a theoretical framework to guide the instrument development process. (Extent?)

- It seems that obtaining input from both, the experts and from the targeted audience, does matter in the reviewed studies for establishing the content/face validity of the instruments.

- The use of age-appropriate response formats may be a crucial factor to take into consideration when working with youth.

- Using pictures or 3- or 4- point Likert scales as response options, may have an advantage in overcoming larger burden for children as compared to typical number of Likert Scales ≥ 5 point scales.
Weaknesses of the Studies

- Studies should report more often whether their psychosocial measures were curriculum-based.

- We need a better understanding of the theory behind but also of the curriculum’s objectives, intensity, duration and content.

- As for validity, most studies examined at least one or more validity properties, however mostly from Type 1 validity.

- For test-retest reliability, it was difficult to draw conclusions or comparisons across studies because there was not a standard parameter to establish acceptable levels.

- Very limited measurement/validation studies within youth from low-income, ethnically diverse families.
Conclusions/Implications

- It can be concluded that currently there is little published scientific evidence that supports reliable and valid use of instruments that measures mediators of dietary behaviors in school-age children—Gap in research.

- As long as information on the psychometric properties of such instruments is not available, investing in evaluating existing instruments validity and reliability and publication of the results is crucial.

- This systematic review provides useful insights for conducting future research to develop and rigorously test evaluation instruments that are appropriate for more diverse audiences and can be embedded into federal and non-federal nutrition education programs.
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