DETERMINING THE RELIABILITY AND VALIDITY OF THE CHILD NUTRITION AND PHYSICAL ACTIVITY SCREENING TOOL TO PREVENT OR TREAT CHILDHOOD OBESITY

By Kelly Nemec

Advisor: Kathryn S. Keim, PhD, RD, LDN
Committee: Mary Mullen, MS, RD, LDN
Diane Sowa, MBA, RD, LDN
Karen Lui, MD
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<thead>
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<th>OUTLINE</th>
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<td>- Timeline</td>
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</table>
TERMINOLOGY

- Underweight: <5\textsuperscript{th} BMI percentile

- Normal weight: ≥5\textsuperscript{th}-<85\textsuperscript{th} BMI percentile

- Overweight: 85\textsuperscript{th}-<95\textsuperscript{th} BMI percentile

- Obese: ≥95\textsuperscript{th} BMI percentile

- Overweight or obese: ≥85\textsuperscript{th} BMI percentile
INTRODUCTION
INTRODUCTION

Childhood overweight or obesity prevalence
- 31.8%

Childhood obesity prevalence
- 16.9%

Several behaviors established by an expert committee of the American Academy of Pediatrics to prevent or treat childhood overweight and obesity


Screening tools have been developed to identify factors that could lead to childhood overweight or obesity

- Only a small number of reliable and valid tools that could be used in a primary care setting
- Research contains moderate to weak evidence of reliability and validity of these tools

Rush Pediatric Primary Care Center currently utilizes the Child Nutrition and Physical Activity (CNPA)

- Not yet been evaluated for reliability or validity
- Have received input from patients and MDs on acceptability and understanding- face validity
PURPOSE AND OBJECTIVES
To determine the reliability and validity of responses to the CNPA screening tool for use at Rush Pediatric Primary Care Center.
OBJECTIVES

1. Determine the content validity of the CNPA.
2. Determine the internal consistency (reliability) of the responses to the behavior questions from the CNPA and the responses to the belief/confidence questions from the CNPA.
3. Determine the construct validity of the CNPA by examining the responses of parents of overweight, obese, and normal weight children.
4. Determine the association between selected behaviors measured by the CNPA and age of child and BMI.
PREVALENCE OF CHILDHOOD OVERWEIGHT AND OBESITY IN THE U.S

- Nationally
  - Obese: 16.9%
    - Hispanic: 22.4%
    - Asian: 8.6%
  - Overweight or obese: 31.8%
    - Hispanic: 38.9%
    - Asian: 19.5%

- No significant change in the obesity prevalence among the 2 to 19 year old children from 2003 to 2012
  - Still too high

PREVALENCE OF CHILDHOOD OVERWEIGHT AND OBESITY IN ILLINOIS

- High School aged youth
  - Overweight: 14.4%
  - Obese: 11.5%

- Low-income children aged ≥2 and <5 years old
  - Overweight: 15.6%
  - Obese: 14.8%

PREVALENCE OF CHILDHOOD OVERWEIGHT OR OBESE IN CHICAGO

- Overweight or obese: 43.3%
  - Kindergarteners: 36.5% (lowest)
  - Sixth graders: 48.6% (highest)
- Sixth grade Hispanic males: 60.3%
- South Lawndale: 52.3%
- Edison Park: 21.4%

PREVALENCE OF CHILDHOOD OBESITY IN CHICAGO

- Obese: 24.9%
  - Kindergarteners: 20.0% (lowest)
  - Sixth graders: 29.2% (highest)
- Sixth grade Hispanic males: 39.8%
- South Lawndale: 32.9%
- Lincoln Park: 12.7%

**BEHAVIORS SELECTED BY THE AMERICAN ACADEMY OF PEDIATRICS**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limiting television and screen time:</td>
<td>≤2 hours/day</td>
</tr>
<tr>
<td>for children &gt;2 years old</td>
<td></td>
</tr>
<tr>
<td>Limiting consumption of sugar-sweetened beverages:</td>
<td>≤1 serving/day</td>
</tr>
<tr>
<td>Increasing consumption of fruits and vegetables:</td>
<td>≥5 servings</td>
</tr>
<tr>
<td>Increasing daily breakfast consumption</td>
<td></td>
</tr>
<tr>
<td>Preparing more meals at home</td>
<td></td>
</tr>
<tr>
<td>Increasing family mealtime at the table:</td>
<td>≥5 or 6 times/</td>
</tr>
<tr>
<td>weekly</td>
<td></td>
</tr>
<tr>
<td>Increasing physical activity:</td>
<td>≥1 hour/day</td>
</tr>
<tr>
<td>Limiting portion sizes</td>
<td></td>
</tr>
</tbody>
</table>

Purpose: to create and test the Family Eating and Activity Habits Questionnaire (FEAHQ) to determine factors related to childhood obesity and observe any family behavior modifications and environmental changes related to weight loss

- n = 40 mothers; Children aged 6-11 years old, 20 healthy weight and 20 obese

- 4 scales of the FEAHQ:
  - Activity level (4 items)
  - Stimulus exposure (8 items)
  - Eating related to hunger (4 items)
  - Eating style (13 items)

Scoring

- Activity Level (4 items)
  - All numbers circled for each item were added to produce the score
  - Items 2 and 3 had negative values
  - Items 1 and 4 had positive values

- Stimulus Exposure (8 items)
  - All numbers circled for each item were added to produce the score
  - Quantitative measures using number of items circled
  - Frequency measures using a five-point Likert scale

- Eating Related to Hunger (4 items)
  - All numbers circled for each item were added to produce the score

- Eating Style (13 items)
  - All numbers circled for each item were added to produce the score

### FAMILY EATING AND ACTIVITY HABITS QUESTIONNAIRE (FEAHQ)

<table>
<thead>
<tr>
<th>Content validity</th>
</tr>
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<tbody>
<tr>
<td>• Ten experts from various healthcare related specialties</td>
</tr>
<tr>
<td>• Administered twice</td>
</tr>
<tr>
<td>• 8 items were removed and the remaining were shortened and made more specific</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test re-test reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The FEAHQ was administered two times, three weeks apart</td>
</tr>
<tr>
<td>• Pearson correlation coefficient used</td>
</tr>
<tr>
<td>• ( r = 0.85 ) (( P &lt; 0.01 ))</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Evaluated the consistency of individual item responses with the remainder of the items on the scale</td>
</tr>
<tr>
<td>• Cronbach’s ( \alpha ) used (( P &lt; 0.05 ))</td>
</tr>
<tr>
<td>• Total FEAHQ ( \alpha = 0.83 )</td>
</tr>
<tr>
<td>• Activity level ( \alpha = 0.82 )</td>
</tr>
<tr>
<td>• Stimulus exposure ( \alpha = 0.78 )</td>
</tr>
<tr>
<td>• Eating related to hunger ( \alpha = 0.86 )</td>
</tr>
<tr>
<td>• Eating style ( \alpha = 0.88 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concurrent-construct validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mean (±s.e.m.) scores of the four subscales were compared between the obese and normal-weight children</td>
</tr>
<tr>
<td>• Activity level</td>
</tr>
<tr>
<td>• ( P &lt; 0.05 )</td>
</tr>
<tr>
<td>• Stimulus exposure</td>
</tr>
<tr>
<td>• ( P &lt; 0.03 )</td>
</tr>
<tr>
<td>• Eating related to hunger</td>
</tr>
<tr>
<td>• ( P &lt; 0.05 )</td>
</tr>
<tr>
<td>• Eating style</td>
</tr>
<tr>
<td>• ( P &lt; 0.01 )</td>
</tr>
</tbody>
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Purpose: to examine the predictive validity of the Family Nutrition and Physical Activity (FNPA) screening tool for evaluating risk for becoming overweight over the course of one year.

n= 704; Parents of first grade students from an urban school district

21 item tool
- Each item coded on either a 2 or 4 point Likert scale and added

Scoring range: 34-66
- Lower scores = more negative behaviors
- Higher scores = positive behaviors

Child BMI and parent height and weight collected

Four quartiles based on baseline (year 1) BMI values
- Means±SD done on each quartile to determine BMI change
  - BMI percent change and BMI50 difference

BMI50: relative change in distance from the BMI at the 50th percentile
- Take into account how BMI should increase with normal growth
- \[ \text{BMI50} = \left( \frac{\text{child BMI} - \text{BMI for 50th percentile}}{\text{BMI for 50th percentile}} \right) \times 100 \]
  - Positive value= >50th percentile
  - Negative value= <50th percentile
- Year 2 BMI50 - Year 1 BMI50 = BMI50 difference
Correlation analyses in each quartile

- Associations between BMI percent change and total FNPA score
- Associations between BMI50 difference and the total FNPA score

- Only significant association ($P<0.05$) was in quartile 4 between BMI50 difference and total FNPA score

### Table 2 Descriptive characteristics and correlations with FNPA total score for the two indicators of BMI change

<table>
<thead>
<tr>
<th>BMI percent Y1</th>
<th>BMI percentile</th>
<th>BMI percent change</th>
<th>BMI50 difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD (range)</td>
<td>Mean ± SD</td>
<td>Correlation with FNPA</td>
</tr>
<tr>
<td>Quartile 1</td>
<td>29.27±15.02 (0.0–49.7)</td>
<td>5.07±15.07</td>
<td>0.018</td>
</tr>
<tr>
<td>Quartile 2</td>
<td>63.16±7.40 (50.03–74.24)</td>
<td>-0.63±12.84</td>
<td>-0.059</td>
</tr>
<tr>
<td>Quartile 3</td>
<td>81.99±4.59 (74.32–89.83)</td>
<td>-2.04±10.33</td>
<td>-0.099</td>
</tr>
<tr>
<td>Quartile 4</td>
<td>96.31±2.97 (89.91–99.96)</td>
<td>-.388±2.63</td>
<td>-0.072</td>
</tr>
</tbody>
</table>

Predictive validity of FNPA scores on BMI50 difference

- Mixed model regression analyses

Fifth and last model

- Controlled for family-based factors (income and age of parents) and individual factors (year 1 BMI50, gender of child, race, and parent BMI)

- Income and age- not significant
- FNPA total score was significant at predicting BMI50 at year 2
  - FNPA total score un-standardized beta= -0.108
  - As the FNPA score increased by every 1 point, the BMI50 score decreased in year 2
    - The score is increasing and more indicative of healthier behaviors

HEALTHY CHILDREN, HEALTHY FAMILY BEHAVIOR CHECKLIST (HCHF-BC)

- **Purpose:** to create the Healthy Children, Healthy Family Behavior Checklist (HCHF-BC) tool to determine changes in physical activity, nutrition, and parent behaviors between the first and last sessions of the program in Expanded Food and Nutrition Education Program (EFNEP) for parents and children.

- **Secondary Purpose:** to make certain that items were understood correctly and to determine the content validity, the feasibility, test-retest reliability, and convergent-criterion validity of the HCHF-BC.

HEALTHY CHILDREN, HEALTHY FAMILY BEHAVIOR CHECKLIST (HCHF-BC)

- Sample: Low-income, female respondents, child between the ages of 3- to 11-years old
  - Field testing: n=308
  - Test re-test reliability: n=38
  - Convergent-criterion validity: n=62

- HCHF-BC version 1 had 14 items
- HCHF-BC version 2 had 16 items
- Subscales: fruit and vegetables, dairy, soda, sweets and fats, physical activity, and parenting

- Scoring range: 1-5; frequency responses

HEALTHY CHILDREN, HEALTHY FAMILY BEHAVIOR CHECKLIST (HCHF-BC)

**Content Validity**
- 7 experts in the field of nutrition and parenting
- Review resulted in the 14 item version 1 HCHF-BC

**Cognitive Testing**
- 13 respondents from low-income households, mainly women
- Resulted in changes of the wording in several questions

**Field Testing**
- Total mean HCHF-BC baseline score: 3.64 (SD 0.54)
- Mean HCHF-BC baseline score by item range: Adult intake of low-fat dairy products 2.58 (SD 1.53; n=291) to Adult fruit availability 3.86 (SD 1.19; n=296)

**Test Re-Test**
- Pearson correlation coefficients between time one and time two scores about two weeks apart
  - $r = 0.83$ ($P < .001$)

HEALTHY CHILDREN, HEALTHY FAMILY BEHAVIOR CHECKLIST (HCHF-BC)

- Determined by evaluating the respondent’s answers to items by correlating with other valid instruments
- Pearson Correlation coefficients
- Total HCHF-BC scores correlated well with the FBC and child food frequency scales

| Table 5. Summary of Correlations of Behavior Checklist (BC) and Subscales With Variables Assessed Using Other Instruments (n = 62 unless otherwise indicated) |
|-------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Instrument                                      | BC Overall     | Fruit and Vegetable | Dairy | Soda | Sweets and Fats | Physical Activity | Parenting |
| FBC                                            | 0.48***        | 0.44***           | 0.16  | 0.31* | 0.09           | —                | 0.32*         |
| Fruit/vegetable                                 | 0.41           | 0.46             | 0.05  | 0.09  | 0.11           | —                | 0.32          |
| Milk                                           | 0.22           | 0.00             | 0.28* | 0.24  | −0.13          | —                | 0.10          |
| Fat                                            | 0.21           | 0.25*            | 0.11  | 0.08  | −0.14          | —                | 0.20          |
| Diet quality                                    | 0.27*          | 0.20             | 0.05  | 0.36**| 0.18           | —                | 0.17          |
| Food security                                   | 0.31*          | 0.28*            | 0.26* | 0.17  | −0.11          | —                | 0.03          |
| Child Food Frequency                            | 0.52***        | 0.35**           | 0.19  | 0.41***| 0.41***        | —                | 0.06          |
| Parental Modeling                               | 0.36***        | 0.03             | 0.14  | 0.26  | 0.05           | 0.43**           | 0.42          |
| SPARK Survey                                   | 0.08           | —                | —     | —     | —              | 0.44***          | —             |
| Child activity (n = 61)                         | 0.07           | —                | —     | —     | —              | 0.36**           | —             |
| Parent activity                                 | 0.03           | —                | —     | —     | —              | 0.39**           | —             |
| Parent Eating and Activity Habits               | −0.10          | 0.06             | 0.16  | −0.31*| −0.24          | 0.08             | −0.07         |
| Child Eating and Activity Habits                | −0.19          | 0.03             | −0.10 | −0.29*| −0.09          | −0.10            | −0.03         |

FBC indicates Food Behavior Checklist; SPARK, Sports, Play, and Active Recreation for Kids; —, comparison not tested because of lack of conceptual overlap in behavioral domains.

aP < .05; **P < .01; ***P < .001; bPearson correlation coefficients; cSPARK parent survey on parent and child activity (metabolic equivalent task units) and parental support.

THE CHILD NUTRITION AND PHYSICAL ACTIVITY SCREENING TOOL

- Started in 2009
  - Three drafts before the current CNPA

- Fall 2012
  - Qualitative interviews with MDs
    - Liked the last three items
    - Disliked the confidence and importance items
  - Cognitive response testing with mothers
    - Minor wording changes were made
In a FNCE abstract by Mullen et al., the relation between children’s BMI percentile and lifestyle behaviors were examined using responses from parents who completed the Nutrition and Physical Activity (NPA) screening tool:

- n = 1071
- Treated at Rush Pediatric Primary Care Center
- 41% of children were obese or overweight

The overweight or obese children were less physically active and consumed < 3 meals/day.

Large amount of the >12-18 year old children engaged in unhealthy behaviors.

Parents of the overweight or obese were interested in making steps towards a healthier lifestyle.

STUDY DESIGN AND SETTING

- Cross-sectional design
  - Content validity
- Longitudinal and cross-sectional approach
  - Retrospective chart review
- Rush Pediatric Primary Care Center
- IRB for content validity and retrospective chart review
Experts in pediatric weight loss and survey/questionnaire development

- The Academy of Nutrition and Dietetics
- The Society for Nutrition and Behavior (SNEB)

Contacted by e-mail and cover letter
CONTENT VALIDITY INSTRUMENTS

- Cover letter
- Directions to evaluate the CNPA
- The CNPA
- Evaluation form- 4 4-point Likert scales for each domain
  - Theoretical relevance, clinical significance, wording, and cohesiveness
CONTENT VALIDITY DATA COLLECTION AND ANALYSIS- OBJECTIVE 1

- Determine the content validity of the CNPA.

- E-mail containing the four documents will be sent to the experts who responded with interest to initial e-mail
  - Reminder e-mails will be sent at one week and two weeks after the e-mail with all four attachments

- Proportions of each domain of the evaluation form will be calculated
  - ≥50% of the sample needs to agree that the domain is theoretically relevant, is clinically significant, has clarity in wording, and is cohesive, in order for changes not to be made to the CNPA.
Data collected from February 1, 2010-February 28, 2015

Inclusion criteria
- Children between the ages of 2 and 18 years old
- Treated at Rush Pediatric Primary Care Center
- Children do not have to be obese

Exclusion criteria
- Children < 2 and >18 years old
- Children <5th BMI percentile
The Child Nutrition and Physical Activity (CNPA) screening tool

- 22 item tool
  - Items created based on the Prevention and Stage 1: Prevention Plus of the American Academy of Pediatrics

- 6 domains
  - Dietary behavior (items 1-5 and 7-11)
  - Screen time (items 6 and 13)
  - Physical activity (item 12)
  - Confidence (item 16 and 19)
  - Importance (item 15 and 18)
  - Perception (items 14, 17, and 20-22)
2 sources
- CNPA and EPIC

CNPA
- Each item as a separate variable
- All are categorical variables except items 7 and 8

Electronic Health Record - EPIC
- Child’s age, height, weight, gender, BMI, and BMI percentile
  - All are continuous variables except gender
RETROSPECTIVE CHART REVIEW DATA COLLECTION

- CNPA distributed at front desk
  - Standardized

- Stored in a locked file cabinet with other RD paperwork

- Medical staff entered data into electronic health record

- CNPA data recorded in excel database by trained employee
  - Coded with identification number

- After data analysis, CNPAs will be placed in document destruction container
CNPA 10% random re-check
BMI and BMI percentile 10% random re-check
10% random re-checks will be done using random numbers table using subject ID

Sort to create two data sets
- Data set one: repeated CNPAs
  - Grouped under same ID number
    - Exploratory - sensitive to change over time
    - Date of completion recorded
- Data set two: 1st time only completed CNPAs

Smaller age divisions may be created
SPSS (SPSS Statistics version 22.0, IBM.com, 2013)
- Proportions
- Measures of central tendency (means±SD)
- Shapiro-Wilks Test
  - Normal distribution: parametric test
  - Non-normal distribution: medians and interquartile ranges and non-parametric statistics
Determine the internal consistency (reliability) of the responses to the behavior questions from the CNPA and the responses to the belief/confidence questions from the CNPA

- Cronbach’s $\alpha$
- Entire sample of data set two
OBJECTIVE 3: CONSTRUCT VALIDITY

- Determine the construct validity of the CNPA by examining the responses of parents of obese, overweight, and normal weight children

- Mann-Whitney \( U \) test
  - \( P<0.05 \)

- Bonferroni correction

- Entire sample of data set two
  - Age groups: 2-5, 6-11, and 12-18

- Chi-square every question, if CNPA total score is not created
OBJECTIVE 4: ASSOCIATION BETWEEN SELECTED BEHAVIORS MEASURED BY THE CNPA AND AGE OF CHILD AND BMI

- Determine the association between selected behaviors measured by the CNPA and age of child and BMI percentile

- Multiple regression
- Entire sample of data set two

- Dependent variable: BMI
- Independent variable: the selected behavior from CNPA
- Control variable: Age
- Dummy variable created for the behaviors selected
  - Meeting the American Academy of Pediatrics cut-off is ‘1’ and all other options are ‘0’
<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish Data Collection</td>
<td>February 1, 2015</td>
</tr>
<tr>
<td>Thesis Proposal</td>
<td>March 2015</td>
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<tr>
<td>IRB Complete</td>
<td>March 2015</td>
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<tr>
<td>Data Analysis and Cleaning</td>
<td>March 2015-July 2015</td>
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<td>Statistical Analysis</td>
<td>August 2015-October 2015</td>
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<tr>
<td>Thesis Preparation</td>
<td>November 2015-December 2015</td>
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REFERENCES

QUESTIONS?