An Obesity Risk Assessment Tool for Young Children: Validity with BMI and Nutrient Values

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ABSTRACT

Objective: Demonstrate validity and reliability for an obesity risk assessment tool for young children targeting families' modifiable home environments.

Design: Longitudinal design with data collected over 100 weeks.

Setting: Head Start and the Special Supplemental Nutrition Program for Women, Infants, and Children.

Participants: Parent–child pairs (n = 133) provided food behavior assessments; 3 child-modified, 24-hour dietary recalls; 3 ≥ 36-hour activity logs; and measured heights and weights.

Main Outcome Measure: Five measures of validity and 5 of reliability.

Results: Validity was excellent for the assessment tool, named Healthy Kids, demonstrating an inverse relationship with child body mass index percentile-for-age ($P = .02$). Scales were significantly related to hypothesized variables ($P ≤ .05$): fruit or vegetable cup equivalents; folate; vitamins A, C, and D; β-carotene; calcium; fiber; sugar; screen, sleep, and physical activity minutes; and parent behaviors. Measures of reliability were acceptable.

Conclusions and Implications: Overall, children with higher Healthy Kids scores had a more healthful profile as well as lower body mass index percentiles-for-age 1.5 years later. Healthy Kids has potential for use by nutrition professionals as a screening tool to identify young children most at risk for excess weight gain, as an evaluation to assess intervention impact, and as a counseling tool to tailor intervention efforts. Future research should include validation in other settings and with other populations.

Key Words: evaluation, obesity, overweight, preschool, risk assessment (*J Nutr Educ Behav.* 2018;■■:■■–■■.)

INTRODUCTION

Parents have direct influence over their children's physical, food, and social environments.[1] Yet, many families' nutrition and parenting practices and lifestyle behaviors create home environments that set young children on trajectories for unhealthful weight gain. Among low-income preschoolers, 31% are overweight or obese in the US.[2] In response to the staggering obesity rates among children, Congress authorized federal programs to include an obesity prevention focus in their education programs for families with young children. These programs include *Head Start*[3]; the *Special Supplemental Nutrition Program for Women, Infants, and Children* (WIC)[4]; the *Supplemental Nutrition and Assistance Program–Education* (SNAP-Ed)[5]; and the *Expanded Food and Nutrition Education Program* (EFNEP).[6] These 4 programs have a presence in all or most low-income communities in the US. Consequently, they have the potential to affect obesity prevalence among participants.[7] Recognizing that this young age may be ideal for intervention, the Institute of Medicine and the American Academy of Pediatrics (AAP) recommend the development of assessment tools targeting families' modifiable environmental and behavioral factors associated with the risk for pediatric obesity.[1,8]

Subsequent to the Institute of Medicine and AAP recommendations, comprehensive evidence-based literature reviews guided the selection of 13 determinants of obesity for assessment tools.[9] The review considered multiple lines of evidence including

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secular trend data, observational cross-sectional and longitudinal studies, interventions, and mechanistic studies. This evidence-based analysis was followed by 2 additional literature reviews: they identified behaviors (n = 23) in this population related to the 13 determinants of obesity[10] and existing tools for assessing the 23 behaviors.[10] No pediatric obesity risk assessment tools were identified for low-income families with 2- to 5-year-old children covering all determinants in the diet, lifestyle, and parenting behavioral domains.[10] Subsequent to that review, Ihmels et al[11] validated a 21-item Family Nutrition and Physical Activity tool for children aged 6–12 years. Dickin et al[12] published a 15-item evaluation tool for an EFNEP intervention targeting low-income parents of children aged 3–11 years. Importantly, no pediatric obesity risk assessment tool covering the identified behaviors in the family environment for the diet, lifestyle, and parenting domains was identified or subsequently published targeting low-income families with children aged 2–5 years for these federal programs.

In response to this identified need, the current authors created a pediatric obesity risk assessment tool using the results of these literature reviews. The content of this tool was evidenced-based with content[9,10] and face[13] validation demonstrated for 45 items representing 23 behaviors in the child's family environment associated with the broad determinants of pediatric obesity.

The goal of the current research was to identify children aged 2–5 years who are at risk for becoming overweight or obese before their body mass index (BMI) rises above age norms. Building on the previous qualitative work,[13] the current article describes the quantitative research to further establish validity and reliability of the final version of the tool. The objectives were to select appropriate items from the 45-item tool for a final parsimonious version, entitled Healthy Kids; further establish validity of the final version of the Healthy Kids tool with low-income parents of young children; and establish reliability of the final version of Healthy Kids using 5 approaches: internal consistency, an item difficulty index, an item discrimination index,

coefficient of variation, and temporal stability. Specifically the hypotheses included: (1) the Healthy Kids total score would be associated with child BMI percentiles-for-age measured 88 weeks after baseline with a lower Healthy Kids score predicting a higher BMI percentile-for-age; (2) the Healthy Kids dietary scale scores would be associated with relevant cup equivalents, dietary energy density, and micronutrient intakes with a higher Healthy Kids dietary scale score predicting higher intakes of vitamins (A, C, D, folate, and ß-carotene), minerals (calcium, magnesium, and potassium), and fiber, as well as lower saturated fats, sugar, and sodium, and energy density; (3) the Healthy Kids physical activity, screen time, and sleep scale scores would be associated with physical activity, screen time, and sleep variables calculated from ≥36-hour logs; and (4) the Healthy Kids dietary scale scores would be positively related to parent food behaviors and mediators.

METHODS
Participants

Parent–child dyads were recruited at *Head Start* (n = 13) and WIC sites (n = 2) in 2 counties in northern California. They were ethnically diverse parents or caregivers aged >18 years, who understood English as a first or second language and had ≥1 child aged 2–5 years enrolled in *Head Start* or WIC. Respondents received $10 for each interview, $30 for the phlebotomy session, and $30 for an optional at-home family photography session. The Institutional Review Board of the University of California, Davis approved the protocol.

Biopsychosocial Framework

The framework used for the design of this validation research was based on systems theory.[14] This framework considered the health of the child in the context of the family environment (Figure 1) and in that respect is similar to the socioecological model used to guide development of the tool's content.[19] In a hierarchical fashion, the model recognizes that the parent's

relevant psychosocial mediators[20] and behaviors[21] create the environment for the young child, and that this in turn drives or influences the child's behaviors.[13] The young child's eating behaviors subsequently drive his or her food intake (measured by 3 modified 24-hour diet recalls), resulting in intakes of micronutrients. The parent's control over the child's physical, screen, and sleep activities in the framework influences the child's behaviors, measured by 3 ≥36-hour activity logs. Thus, as specified by this framework, intake of nutrients and physical activity, screen, and sleep behaviors by the child can effect changes in biochemical parameters and body weight, indicators of the child's health status (Figure 1).

Data Collection and Timeline

The researchers collected baseline data over 15 weeks in 4 unique sessions, in person (weeks 1, 12, and 15) and by phone (week 6). Informed consent was collected before data collection began. At week 1, a parent completed the demographic questionnaire, answered a parent food behavior checklist and an assessment of parent behavioral mediators, and completed the child's ≥36-hour physical activity, screen time, and bedtime log, as well as the child's 24-hour dietary recall (Figure 1). The ≥36-hour log and 24-hour diet recall were readministered at weeks 6 and 12, for a total of 3 child activity logs and 3 child dietary recalls. The 45-item version of Healthy Kids was administered to parents on week 12. On week 15, the researchers collected the child's height and weight measurements. In addition, the child provided a fasting blood sample, blood pressure, and body temperature, the results of which will be reported elsewhere. Stability reliability data were collected a second time at week 24. The child's anthropometric data were collected at another in-person session at week 100. Each session had a maximum duration of 60 minutes. The data collection team was trained in dietary, anthropometric, and biochemical methods by the principal investigator, other project researchers, and a team at the US Department of Agriculture (USDA) Western Human Nutrition Research Center.