A Validation Study of the Automated Self-Administered 24-Hour Dietary Recall for Children, 2014 Version, at School Lunch

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ABSTRACT

Background Obtaining valid and reliable estimates of usual dietary intake at a reasonable cost is a challenge in school-based nutrition research. The Automated Self-Administered 24-Hour Dietary Recall for Children, 2014 version (ASA24 Kids-2014), a self-administered, computerized 24-hour dietary recall, offers improved feasibility over traditional interviewer-administered 24-hour recalls.

Objective This mixed-methods study examined ASA24 Kids-2014's validity for measuring dietary intake from National School Lunch Program lunches.

Participants/setting After 24% attrition, 96 middle-school students from three urban schools in eastern Pennsylvania participated in the study. A subsample of 27 participants completed qualitative interviews. Data were collected in the spring of 2014.

Main outcome measures Self-reported ASA24 Kids-2014 data were compared to direct observations of school lunch, which served as the criterion measure. Dependent variables included eight meal components selected from the National School Lunch Program guidelines (fruit, vegetables, grains, protein-rich foods, dairy, oils, solid fats, and added sugars). A supplemental interview collected qualitative data regarding students' perceptions of content and substantive validity.

Statistical analyses The Wilcoxon signed rank test and Spearman's ρ examined criterion-related validity; qualitative content analysis examined content and substantive validity.

Results Participants inaccurately recalled food items eaten at lunch, as 58% of foods were reported in error. However, among foods recalled correctly, no statistically significant differences emerged for estimates of portions consumed for six meal components (fruit, vegetables, grains, protein-rich foods, oils, and added sugars). In addition, statistically significant positive correlations emerged between ASA24 Kids-2014 and direct observation for all estimates. Qualitative data identified students' interest and motivation, comprehension, memory, and English-language fluency as relevant sources of error.

Conclusions Middle school students have difficulty recalling food items eaten at school lunch; however, they are somewhat successful at estimating intake of accurately recalled foods using ASA24 Kids-2014. Like many self-administered computerized recalls, it remains limited by substantial error. Findings have implications for the development of ASA24 Kids-2014 among diverse youth in urban school settings.
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A CHALLENGE OF SCHOOL-BASED NUTRITION research is finding dietary assessment instruments that deliver valid and reliable estimates of usual intake at reasonable cost. Twenty-four–hour recall interviews produce reliable data, but require time-intensive resources to implement.[1] Researchers tend to select brief food frequency questionnaires[2] that are feasible to administer to large groups of participants; however, these instruments lack the precision to reliably quantify individuals' usual dietary intake.

The Automated Self-Administered 24-Hour Dietary Recall for children, 2014 version (ASA24 Kids-2014)[3] offers a solution. It combines the feasibility of a self-administered questionnaire with the established methodology of a 24-hour recall to measure dietary intake among youth aged 10 and older.[4] When compared to interviewer-administered 24-hour dietary recall, 8- to 13-year-olds using the beta version of ASA24 Kids achieved 48% strict matches (ie, food items that match the interview report) and 18% loose matches (ie, foods that match the same food category, but not the specific item).[4] Other studies have shown similar recalls to be very accurate in this regard. Impressively, the Young Adolescents' Nutrition Assessment on Computer[5] achieved 67% to 97% matches when compared to a 24-hour recall interview, and 76% to 97% matches when compared to self-reported food records among 11- to 14-year-old students.

These findings are limited by shared method and source variance common to both the criterion measures and the self-administered recall, which may inflate estimates of validity. Recent studies have addressed this problem by using direct observation as the criterion measure. When compared to observations of school lunch among 9- to 11-year-olds, ASA24 Kids-2012 demonstrated 37% food item matches (ie, foods recalled by respondents and recorded on the criterion measure), 35% omissions (ie, foods omitted by respondents but recorded on the criterion measure), and 27% intrusions (ie, foods recalled by respondents but not recorded on the criterion measure).[6] Other self-administered, computerized recalls for youth yield comparable results when validated with direct observations. For example, the Food Intake Recording Software System[7] and the Portuguese Self-Administered Computerised 24-Hour Dietary Recall[8] demonstrated 40% and 67% matches, respectively, among children between 7 and 11 years old. Similarly, the Healthy Eating Self-Monitoring Tool[9] achieved 33% to 62% matches among 11- to 14-year-olds' self-report of fruit and vegetables eaten. Other validation studies suggest that the proportion of matches can be as high as 82% to 90% with and without adult assistance, respectively.[10,11]

In addition to enabling students to accurately identify the foods they eat at school lunch, valid self-administered recalls will also accurately measure the portion sizes students consume. Interviewer-administered 24-hour recalls demonstrate small-to-medium portion size correlations (0.46 to 0.51) with direct observation of school lunch as the criterion.[6,7] In comparison, computerized self-administered recalls vary in the strength of their correspondence with direct observations. The 9- to 11-year-olds using the Food Intake Recording Software System achieved a small, statistically significant portion-size correlation of 0.46 with direct observations,[7] whereas ASA24 Kids-2012 demonstrated a small correlation of 0.18 that was statistically nonsignificant with the same age group.[6] Comparatively, 11- to 14-year-olds' self-reports of fruit and vegetable consumption on the Healthy Eating Self-Monitoring Tool[9,12] have shown statistically significant small-to-medium correlations (0.41 to 0.65) when compared to direct observation as the criterion.

CONTRIBUTIONS OF THE CURRENT STUDY

To date, no research has evaluated ASA24 Kids-2014's validity with middle-school students. Furthermore, important dimensions of validity remain unexamined. Content validity,[13] such as the clarity of questions and the comprehensiveness of response options, is unknown. In addition, substantive validity[14] issues, such as how well the measure supports respondents' memory[15] and motivation,[16] buffers against social desirability bias,[17] and accommodates respondents' cultural and linguistic backgrounds[18] have received little attention in the literature. Documenting the impact of these validity issues will clarify how to improve students' performance on ASA24 Kids.[6]

This study's primary purpose was to examine ASA24 Kids-2014's criterion-related validity in a sample of culturally and linguistically diverse middle school students. In addition, this investigation sought to identify factors related to ASA24 Kids-2014's content and substantive validity through qualitative interviews. These data were integrated with the quantitative results to contextualize their interpretation.

METHODS

Research Design and Study Sample

This study used a nested mixed-methods design with quantitative analyses as the dominant method. As such, a subsample from the larger quantitative study provided qualitative data to supplement interpretation of the findings. Sixth-, seventh-, and eighth-grade students in three urban middle schools in eastern Pennsylvania were recruited from their homeroom classes during the spring of 2014. This was a sample of convenience, as homerooms were selected at school administrators' discretion. A verbal description of the study accompanied the distribution of consent forms to approximately 1,000 students. Consent forms were provided in both English and Spanish. Students were eligible to receive small prizes for returning forms with parent signatures, regardless of whether they received permission to participate. The Lehigh University Institutional Review Board approved all study procedures.

Inclusion criteria for the quantitative sample included enrollment in the 6th through 8th grades, the absence of visual or intellectual impairments, English or Spanish as a native language, and eating school lunch. ASA24 Kids-2012 invites respondents to complete the measure in either English or Spanish. As the English-language measure was the focus of this study, students were excluded from the analysis if they chose to complete the measure in Spanish. Participation in the quantitative sample was the only inclusionary criterion for participating in the qualitative sample. Fifteen native English-speaking students and 15 native Spanish-speaking students were randomly selected from the quantitative sample. This purposive sampling technique was intended to obtain equal representation of native English and Spanish speakers in the sample, in order to adequately explore native language status as differential variable.[19] The sample size was set to maximize the likelihood of achieving data saturation; in other words, no new data were expected to emerge after conducting all 30 interviews.[20]

Quantitative Methods

Measures and Procedures. Eight meal components were selected from the nutrition standards set forth in the National School Lunch Program and served as dependent variables.[21] Meal components of likely interest to researchers and lay stakeholders investigating the effects of school-based nutrition interventions were prioritized and included fruit, vegetables, dairy, grain, protein-rich foods, oils, solid fat, and added sugar.

ASA24 Kids-2014 applies the Automated Multiple Pass Method[22] to prompt respondents to list all foods and beverages consumed in the previous 24 hours, to identify each portion size, and to estimate how much of the portion was consumed. ASA24 Kids-2014 quantifies respondents' intake of each meal component using the US Department of Agriculture's Food and Nutrient Database for Dietary Surveys, version 4.1,[23] and the MyPyramid Equivalents Database.[24] The measure's format incorporates empirically derived features to facilitate use by children.[25,26] It is available in both English and Spanish. To control threats to internal validity,