Journal of Nutrition & Food Sciences
ISSN: 2155-9600

Sharma et al., J Nutr Food Sci 2011, S8
DOI: 10.4172/2155-9600.S8-001

Research Article Open Access

Food Preferences Assessment: Development of a Questionnaire and Evaluation of Reliability in African American and Latino Children from Low Socio Economic Area

Sushma Sharma[1,2]*, Lindsay S Roberts[1], Mark L Hudes[2] and Sharon E Fleming[1,2]

[1]*Dr. Robert C and Veronica Atkins Center for Weight and Health, University of California, Berkeley, CA 94720-3104, USA*
[2]*Department of Nutritional Sciences and Toxicology, University of California, Berkeley, CA 94720-3104, USA*

Abstract

Background: African American and Hispanic children living in low socioeconomic index neighborhoods are more at risk of obesity-associated metabolic disease than their higher-socioeconomic index and/or white peers. Currently, there is a dearth of consistent and reliable questionnaires to evaluate food preferences in these children. Therefore, we aimed to develop food preferences assessment questionnaires for African American and Latino children living in inner-city communities.

Methods: A total of 112 children, 8-11 years of age, identified by a parent as being either African-American or Latino were recruited and administered questionnaires. Internal consistency, one measure of reliability, was assessed by calculating the Cronbach's alpha of test scores. Test-retest design was used to assess the reproducibility by calculating the intra-class correlation coefficients (ICC) and Pearson correlation coefficients.

Results: The food preference indices for 9 food groupings exceeded the threshold for acceptability set at greater than 0.70 when calculated for the entire sample of children with valid scores for all items. Both the test-retest ICC and Pearson's correlation coefficients were greater than 0.70 for most of the food groups and values were between 0.6 and 0.7 for others. Multiple linear regression analysis showed that the scores for preference of all the food groups included were not significantly related to the child's ethnicity or gender when entered before or after adjusting for the other two variables. For only two food preference indices, beverages and not sweetened beverages foods, scores increased significantly with child age.

Conclusion: We present an internally consistent and reproducible questionnaire to evaluate food preferences in 8-11 yr old African American and Latino children from low socio economic communities. Additional evaluations would be needed to determine if this tool is reliable for children from other ethnicities and ages.

Keywords: Food Preference; Eating behavior; Questionnaires; African –American; Latino; Children; Chronbac alpha; Internal consistency; Socioeconomic index

Introduction

Childhood obesity is increasing at alarming rates in both developed and developing countries. Overweight and obese children are at substantially increased risk of becoming overweight adults, with attendant increased risk of morbidity and mortality. In the current context, primary prevention of childhood overweight is an international priority. Therefore, studying the development of eating patterns has become more important for understanding energy balance and weight regulation in growing children.

Preferences play an important role in defining child food patterns, as preferences are linked to food acceptance [1]. Although food intake of very young children is largely influenced by environmental factors such as role modeling, frequency of food exposure, and portion sizes [2], food preference has been reported to be the strongest predictor of eating behavior in children of most ages [3] as well as in adults [4,5]. Understanding children's food preferences and how they change over time is recognized to be critical when planning effective nutrition education and dietary intervention programs [6]. Research shows that children develop their food preferences as they grow and are exposed to a variety of food items, textures, taste and flavors [7] as they learn from modeling in the family, and from their experiences at home, in the school and with their friends [8]. Environmental influences such as television advertisements [9], school-based nutrition education programs and school meals also play a role [10,11]. Interestingly, food preferences have been shown to change very little between the ages of 4 and 8 yrs of age [11].

Socio economic index has been reported to influence the food preferences and eating behavior in children [12] and their families [13]. Lack of parental education, nutrition knowledge, and affordability of healthy food have been shown to contribute towards unhealthy eating behavior in low socioeconomic index families [14]. Additionally, food preferences differ across ethnicities, in part because culture influences the range of foods to which young children are exposed. Previous attempts [3] to develop reliable food preference tools for school aged children were not able to address all factors which influence the child's food preferences.

It is well recognized that evaluation tools must be appropriate for

***Corresponding Author:** Sushma Sharma, Department of Nutritional Sciences and Toxicology, 212 Morgan Hall, University of California, Berkeley, CA 94720-3104, USA, Tel: (+1) 510-642-9944; Fax: (+1) 510-642-0535; E-mail: sushma@berkeley.edu

Received December 21, 2011; **Accepted** April 24, 2012; **Published** April 28, 2012

Citation: Sharma S, Roberts LS, Hudes ML , Fleming SE (2012) Food Preferences Assessment: Development of a Questionnaire and Evaluation of Reliability in African American and Latino Children from Low Socio Economic Area. J Nutr Food Sci S8:001. doi:10.4172/2155-9600.S8-001

use in the population of interest. As our goals relate to the development of interventions that can reduce risk of metabolic disease associated with obesity in children, we focused on African American and Latino children since they are at higher risk for obesity than their non-Hispanic white peers [15]. Although there appears to be leveling off in the prevalence of obesity among some groups of U. S. children [15], the high risk for metabolic syndrome among overweight and obese children remains of great concern. In order to determine whether nutrition interventions have the potential to improve relevant behaviors in targeted children, reliable and consistent tools must be used to assess the improvements in food preferences needed to support behavior change. Currently, there is a dearth of consistent and reliable questionnaires to evaluate food preferences in elementary-school aged, including those of African American and Latino ethnicities. Thus, in this study we aimed to develop a questionnaire that would be reliable and internally consistent when used to evaluate preferences for 9 food groups of interest in African American and Latino children living in inner-city, low socioeconomic communities.

Methods

Questionnaire development

A Food Preference Questionnaire was developed and based on one [16] administered to parents of 4–5-year-olds, then later used as a self-report measure for children 9-11years [17] and 8-16 years [18]. The list of foods and beverages was adapted for the present study to include a range of vegetables, snacks, beverages, dairy foods, and grains and cereals available to children in inner-cities in California. The final questionnaire featured 69 food items, identified in both English and Spanish. Children were asked to indicate how much they liked each food by ticking the appropriate box. There were six response choices, scored 0 to 5, as follows: 'Never tried it', 'I hate it', 'I don't really like it', 'It's OK', 'I like it', and 'I love it'. Each phrase was accompanied by sad-to-happy faces to facilitate understanding. On a separate questionnaire, children were asked for their age, gender and ethnicity, and for the ethnicity of their mother.

To ensure content and face validity, items and their groupings were developed and reviewed by experts in the field. As needed, items were eliminated or modified until experts approved a total of 69 items.

Participants

To qualify, potential participants needed to be 8-11 years of age, identified by a parent as being either African-American or Latino (defined as having at least one parent of either ethnicity), and able to speak conversational english. Additionally, potential participants needed to regularly attend specific after-school programs located in inner-city regions of Oakland and Richmond, CA. Care was taken to ensure that no subject participated more than once.

The target sample size was 100 as this is recognized to give good precision for measuring repeatability and agreement of instruments [19]. A total of 112 child participants were recruited and administered questionnaires. Demographic data for 2 participants required they be excluded since either age or ethnicity did not meet our inclusion criteria; and data for one participant were excluded due to a repetitive answering pattern. Lastly, data for 3 participants were disregarded since they had an incomplete set of data (defined as having all demographic data, and an adequate number of valid responses for each food preference index). Thus, analyses were performed using a final sample size of 106.

Data collection and handling

This study and all questionnaires were approved by the Committee for the Protection of Human Subjects at the University of California at Berkeley prior to beginning recruitment or data collection. Trained personnel administered questionnaires in group settings. Participants completed the questionnaires at their own pace. Staff members were available to answer individual questions, assist with reading if needed, and to check questionnaires for completeness.

Foods were grouped into nine categories (Supplementary Table 1) – vegetables, snacks, beverages, dairy foods, grains and cereals, not sweetened foods, sweetened foods, sweetened snacks and sweetened beverages – which defined the food preference indices. Total scores for each item included in each index were calculated as the sum for those items, divided by the number of items. If more than one choice was marked for an item, the mean score of marked choices was assigned. To be included in the calculation of the index score, valid responses for each child were required for 75% of the items included in each index. To be included in assessments of Cronbach's alpha or test-retest reliability, value responses for each child were required for 100% of the items included in each index.

Internal consistency, one measure of reliability, was assessed by calculating Cronbach's alpha. This statistics was used to determine how well the individual items of the scores fit together, and whether they assess the same construct [20,21]. A Cronbach's alpha of 0.7 or more has been defined as having good internal consistency and being adequate for among- group comparisons [20], and this cutoff was used when interpreting data from this study. Reliability of the scores was also examined by determining the impact on the alpha value of removing each individual item in turn. However, as cautioned by others [19], care was taken not to sacrifice utility and purpose of the final questionnaire by using changes in Cronbachs' alpha as a sole criteria for question selection.

Retest evaluations were administered 1-3 weeks following the first administration. This time interval was selected as being of sufficient duration to make it unlikely children would remember their initial choices to questions, yet not of such long duration as to allow for developmental changes that could inadvertently influence choices to questions. Due to unanticipated logistical problems, retest questionnaires could be administered at only 30% of the community sites. To determine test-retest reliability at the individual level, the intra-class correlation coefficient (ICC) was used to assess absolute agreement among scores from the two tests [19]. Values for Pearson's correlation coefficient were calculated also.

Statistical analysis

Analyses were performed using SPSS version 18.0 for Windows. We selected $p < 0.05$ as our definition of statistical significance. Data

	African American	Latino
Number	46	60
Age[1] (mean ± SD)	9.35 ± 1.06	9.33 ± 1.11
Grade[1] (mean ± SD)	4.00 ± 0.93	4.05 ± 1.08
Gender[2], % male	41%	53%
Ethnicity of mother, % same as child	94%	98%

[1]Differences not statistically significant using two-tailed t-test following Levene's test for equality of variances.
[2]Differences not statistically significant using Chi Square test.

Table 1: Demographics of Study Participants.

Preference Index	Cronbach Alpha			Test-Retest (n=36)		
	Numbers of items and subjects	α All items	α, 1 item deleted[1]	Number of items[2]	ICC[3]	r-values[3]
Vegetables	16, 88	0.79	0.79	12-16	0.80	0.80
Snacks	18, 90	0.87	0.89	14-18	0.80	0.80
Beverages	19, 95	0.78	0.79	15-19	0.71	0.71
Dairy Foods	13, 98	0.79	0.80	10-13	0.65	0.66
Grains and Cereals	10, 99	0.78	0.78	08-10	0.61	0.60
Not Sweetened Foods	45, 74	0.91	0.91	38-45	0.74	0.75
Sweetened Foods	24, 94	0.91	0.91	18-24	0.75	0.75
Sweetened Snacks	11, 100	0.87	0.87	09-11	0.79	0.79
Sweetened Beverages	11, 99	0.80	0.80	09-11	0.62	0.61

[1]Alphas shown following deletion of the single item least related to the other items in the index.
[2]Scores for indices were calculated for all participants with valid responses for at least 75% of the items included in each index. The numbers of items required for inclusion in each index are provided.
[3]ICC=Intraclass correlation coefficient; r-values = Pearson correlation coefficients.

Table 2: Reliability – Cronbach alphas, and test-retest correlations.

were double entered for accuracy. Reliability of indices was evaluated by calculating Cronbach's alpha, ICC and Pearson's correlations. Satisfactory internal consistency was defined to be alpha ≥ 0.70 and satisfactory repeatablity defined as ICC ≥ 0.70. Finally, the relationships of three dependent variables (ethnicity, gender, and age) to each of nine independent variables (i.e. the nine food preference indices) was evaluated using multiple linear regression analysis methods.

Results

This analysis was performed on data from 46 African American and 60 Latino children with mean ages of 9.3 yrs (Table 1). Gender proportions were not significantly different for these two groups and the ethnicity of the child and child's mother was the same for more than 90% of children in both groups.

Cronbach's alpha, calculated for the food preference indices for 9 food groupings (vegetable, snacks, beverages, dairy foods, grains and cereals, not sweetened foods, sweetened foods, sweetened snacks, and sweetened beverages) exceeded the threshold for acceptability set at greater than 0.70 when calculated for the entire sample of children with valid scores for all items (Table 2). When the single item least related to the other items in the index was deleted, the alphas changed very little, if at all. Both the test-retest ICC and Pearson's correlation coefficients were greater than 0.70 for vegetables, snacks, beverages, not sweetened foods, sweetened foods and sweetened snacks; values between 0.6 and 0.7 were observed for dairy foods, grains and cereals, and sweetened beverages.

When calculated separately for African American and Latino children, alphas were greater than 0.70 for all the food preference indices for both ethnicities (Supplementary Table 1). When calculated separately for male and female children, alphas also were greater than 0.7 for all indices for both genders. When calculated separately for each of the 4 ages of children included in the sample, alphas exceeded the cutoff of 0.7 for all indices for both 8 and 9 year old children. For 10 and 11 yr olds, however, alphas of 0.6-0.7 were observed for sweetened beverages, and for 11 yr olds only, an alpha of 0.68 was observed for beverages, grains and cereals. Supplementary Table 2 shows the unadjusted means and standard deviation for food preference indices by ethnicity, gender and by age.

Regression coefficients assessed using regression analyses showed that the scores for preference of the 9 food groupings were not significantly related to the child's ethnicity or gender when entered before or after adjusting for the other two variables (Table 3). For only two food preference indices, beverages and not sweetened beverages foods, scores increased significantly with child age.

For each food item evaluated, the percent of the overall sample that never tried each food is provided (Supplementary Table 3). Additionally, the mean values prior to and following exclusion of the "never tried" responders are provided for the reader.

Discussion

To our knowledge, this is the first study to report an internally consistent food preference questionnaire (Cronbach's alpha > 0.70) specifically evaluated in 8-11 yr old African American and Latino children living in low socioeconomic, inner-cities. This questionnaire showed high test-retest reliability when evaluated in a sub-sample of this population for most indices but not all. Thus, a large follow-up evaluation is needed to determine whether modifications will be needed to improve reproducibility for some items. Using a similar test-retest design, others have reported good reproducibility for food preference questionnaires tested in adults [22] as well as in children [23]. As the children included in our study are more at risk of obesity-associated metabolic disease than their higher-socioeconomic index and/or white peers, our questionnaire should provide a tool for assessing efficacy of eating behavior intervention efforts in high-risk populations such as these.

In our study, all the food preference indices for 9 nutritionally important food groupings (vegetable, snacks, beverages, dairy foods, grains and cereals, not sweetened foods, sweetened foods, sweetened snacks, sweetened beverages) had acceptable internal consistency, with alphas > 0.7 for the overall sample. While others have also developed and used tools to assess food preferences [3,5,7,11,22-27], assessments on children between 8 and 11 years have been reported in only a few studies in the US [3,5,23]. More importantly, despite it being acknowledged that ethnicity, culture and economic status of the family have a direct influence on food preferences and eating behaviors in children [12,13], efforts have not been made to validate assessment tools in children most at risk of metabolic diseases associated with obesity. Our results showed that internal consistencies for food preference questionnaire were acceptable for most indices in both the African American and Latino children and, in regression analyses, mean scores were not significantly related to ethnicity. Therefore, we suggest that these questionnaires can reliably be used in both African American and Latino children.

We observed that internal consistency of the food preference

Dependent Variables, Preference Index		Independent Variables		
		Ethnicity[1]	Gender[2]	Age
		Standardized regression coefficient1		
Vegetables	I[3]	-0.082	0.094	0.133
	II[4]	-0.069	0.091	0.136
Snacks	I	-0.164	0.019	0.161
	II	-0.161	0.006	0.150
Beverages	I	-0.158	-0.001	0.200
	II	-0.157	-0.012	0.197*
Dairy Foods	I	-0.121	-0.105	0.108
	II	-0.134	-0.117	0.101
Grains and Cereals	I	0.078	-0.119	0.109
	II	0.067	-0.107	0.106
Not Sweetened Foods	I	-0.074	-0.009	0.149
	II	-0.069	-0.012	0.140
Sweetened Foods	I	-0.167	-0.032	0.174
	II	-0.170	0.046	0.170
Sweetened Snacks	I	-0.172	-0.045	0.142
	II	-0.178	-0.061	0.137
Sweetened Beverages	I	-0.150	-0.027	0.204*
	II	-0.152	-0.038	0.200*

[1]Ethnicities coded as follows: African American = 1; Latino = 2.
[2]Genders coded as follows: Male = 1; Female = 2.
[3]Individual bivariate unadjusted standardized regression coefficients determined using three separate regression equations.
[4]Multivariate adjusted standardized regression coefficients, with ethnicity, gender and age entered simultaneously into each model.
*p≤.05.

Table 3: Regression Analysis: Association of ethnicity, gender and age of participant with scores for food preference indices (n=106).

indices was similar for boys and girls in our cohort. Additionally, mean scores were not significantly influenced by gender. Our results differ from a previous study [28], which observed that food preferences differed between genders and that gender differences varied among elementary, middle, and high school students.

The mean scores for two food preference indices (beverages and not sweetened foods) were significantly influenced by age of the child. Differences in food preferences were previously reported to vary by school level of the child [3]. It is possible that a wide age range is needed to observe a statistically significant association between age and food preference scores.

Our results suggest that this questionnaire is suitable for both African American and Latino children, and for both boys and girls. Thus, this can be used as a reliable tool to assess the influence of targeted interventions on changes in eating behavior in children such as these. Although this questionnaire might be appropriate also for performing evaluations in children of other ethnicities, researchers would first need to evaluate reliability in those populations. Once reliable food preference tools are identified for both low and high-risk populations of children, these tools can be used in a study that aims to evaluate relationships among food preference, food selections, obesity and related metabolic disease in children. These tools can be used also to determine whether or not the efficacy of interventions differs by population group.

Limitations of this study include restriction to low income, inner-city, 8-11 year old, African American and Latino children, which preclude extrapolation to children of other races, ages and socioeconomic backgrounds. Due to unanticipated logistical problems from school education administration, the retest questionnaires could be administered at only 30% of the community sites. Also, these indices are specific for the subject matter we were particularly interested in, which limits their use for evaluating preferences of other food groups (eg. Meats).

Acknowledgement

Funding was provided by the Dr. Robert C and Veronica Atkins Foundation, Lawrence and Victoria Johnson, and University of California at Berkeley's College of Natural Resources annual fund which supported undergraduate researchers through The Sponsored Projects for Undergraduate Research Program. The authors are indebted to the participating children and their families.

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This article was originally published in a special issue, **Dietary Methodology** handled by Editor(s). Dr. Christopher Papandreou, University of Crete, Greece