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Differences in home food and activity environments between obese and healthy weight families of preschool children

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Abstract

Objective—To develop and test a home food and activity instrument to discriminate between the home environments of obese and healthy weight preschool children.

Design—A modified questionnaire about home environments was tested as an observation tool.

Setting—Family homes.

Participants—Thirty-five obese children with at least one obese caregiver were compared to forty-seven healthy weight children with no obese caregivers.

Main Outcome Measures—Home observation assessments were conducted to evaluate the availability of devices supporting activity behaviors and foods based on availability, accessibility, and readiness to be eaten.

Analysis—Agreement statistics were conducted to analyze psychometrics and MANOVAs were conducted to assess group differences, significance, $P < .05$.

Results—Home observations showed acceptable agreement statistics between independent coders across food and activity items. Families of obese preschoolers were significantly less likely to have fresh vegetables available or accessible in the home, were more likely to have a TV in the obese child's bedroom and had fewer physical activity devices compared to healthy weight preschoolers.

Conclusions and Implications—Families of young children live in home environments that were discriminatively characterized based on home observations. Future tool refinement will further clarify the impact of the home environment on early growth.

Keywords

preschool; obesity; home; environment; assessment

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The data were collected at Cincinnati Children's Hospital Medical Center and analyzed at the 1st author's present affiliation.

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INTRODUCTION

The prevalence of obesity (95th percentile of body mass index; BMI) for US preschool children aged 2–5 years has been estimated to be 12.1%, double the prevalence rate from the 1970s ^{1,2}. The etiology of obesity is considered to be multifactorial, including genetic, behavioral, and environmental causes ³. To date, successful childhood obesity prevention and treatment programs often include multiple behavioral and social components ^{4,5}. While evidence supports behavioral family-based interventions that include dietary self-monitoring, goal-setting, contingency management and changes in dietary intake and activity level, other potential targets have received less empirical attention, including modification of the home food and activity environment ⁶.

Based on an ecological model to understand obesity, the home *physical* environment has been shown to correlate with children's dietary intake and both sedentary behavior and physical activity ^{7–11}. Preschoolers consume their daily energy intake from both child care settings and the home environment. Data from surveys are inconsistent on where the majority of calories are consumed (homes versus child care). For instance, surveys in U.S. samples indicate that while preschool aged children are increasingly eating more calories obtained away from home, the average total daily energy intake from home food has remained unchanged and represents about 71% of calories from 2003–2006 ¹². However, the 2011 Benchmarks for Nutrition in Child Care reported children enrolled in child care programs consume ½ to ¾ of their daily energy intake in child care settings¹³. Studies show that intake of healthy foods is directly and strongly linked to the presence of such foods in the home, and whether such foods are accessible (i.e., can be easily consumed) ^{9,14}. Moreover, intake of fruits and vegetables ¹⁰ were most strongly associated with fruits and vegetables being available in the home and a child's taste preference.

Physical activity (PA) correlates with the home physical environment have been less conclusive due in part to the relatively limited development of validated instruments in this area of research. A comprehensive review by Davison and Lawson ¹⁵ on the relationship between the physical environment and PA among children found no association in 4 out of 6 studies focused on home environments. Thus, the impact of the physical home food and activity environment on healthy weight management behaviors warrants attention as an important consideration for interventions augmenting behavioral family-based treatment programs.

Assessing the home environment has typically included self-report inventories that include examine either food availability *or* activity devices ^{10,16,17}. Researchers have begun to include observational methods to provide more objective measurements of the home food *and* activity environment in order to mitigate potential self-report bias ^{18–20}. Bryant and colleagues studied 85 families with a child between the ages of 3 and 8 years who completed a telephone survey and a subsequent home observation visit to assess for the presence of healthy and unhealthy foods and physical activity and media items. The Healthy Home Survey (HHS) included the presence of items and the accessibility, in terms of the child being able to reach it with their hand. The findings using the HHS were limited by lack of information regarding objective accessibility measurements (i.e., using a tape measure). Notably, participating children reportedly were a mean of 64th BMI percentile (SD=28), indicating that very few children were actually in the obese category and the study therefore did not examine whether the home environment tool was sensitive to differences between the homes of obese versus healthy weight children. Results indicated high, but variable, reliability (0.22–1.00) and validity estimates (0.07–0.96) for the survey, with specific scores being lower for perishable foods and eating policy items. A review of literature suggests no existing studies of the home food and activity environment have included families of

preschool children which examined differences across healthy and obese weight classifications.

The purpose of this project was to examine the discriminative validity of a home observation measure to identify differences in home food and activity environments according to caregiver and preschool child weight status. Study aims were to address the lack of objective assessments of the home food and activity environment with children and families across healthy and obese weight classifications. Study hypotheses were that in the homes of obese caregivers and preschoolers there would be: 1) greater availability and accessibility of unhealthy foods and drinks, 2) fewer available and accessible fresh fruits and vegetables, 3) a greater number of sedentary devices (TV's, video, games), and 4) fewer physical activity devices compared to the homes of healthy weight preschool children.

METHODS

Home Health Environment (HHE): Instrument development

Previously validated self-report instruments were modified and objectively administered using an observation-based methodology by trained independent research assistants. A review of the literature and existing measures of home food inventories and activity devices provided the preliminary item pool^{11,21–25}. Food and activity items evaluating presence in the home were primarily drawn from an existing measure with adequate construct validity and test-retest reliability (most intraclass correlation coefficients > .60)¹¹. To increase the reliability of coding items, operational definitions of presence and accessibility were developed, in addition to specific nutritional content to help aid in identifying certain foods (e.g., low sugar cereal referenced grams of sugar per serving). In addition, fruit and vegetables were expanded to a specific list of fruits and vegetables versus a single category. Experts in pediatric obesity assessment and treatment were consulted to further refine items and operational definitions, emphasizing developmentally appropriate items for preschool children (e.g., seated scooters). See tables 1–3 for a complete listing of test items.

The instrument resulted in 4 areas of assessment: 1) healthy and unhealthy foods and drinks, 2) fresh fruits and vegetables, 3) electronic media devices, and 4) devices or physical areas in or around the home that promote physical activity. Aspects of food/drink items evaluated included availability (food or drink physically located within the home), accessibility (could child reach the food), and readiness to be consumed (the food could be immediately eaten without preparation or opening a container). For example, if a fruit drink had a straw inserted in the pouch or a chip bag was already opened, these were considered “ready to consume” because a parent was not needed to prepare it for drinking or eating. If 2 or more eligible items were observed, the food that was most accessible to the child was rated in the category. To structure the accessibility measurement by coders, standard heights (50th percentile for age and gender) were used to estimate the height of the child, with an additional 18” reach for arm length. Tape measures were used by coders with these predetermined height measurements labelled on the tape measure. Thus, height estimates used to establish child accessibility were individualized for each household, based on child age and gender.

Healthy and unhealthy foods and drinks—Twenty-three foods or drinks were evaluated based on item descriptions (e.g., 100% fruit juice) or using objective criteria taken from food labels. Classifications of foods and drinks also generally followed the stoplight system for foods, in which green foods were considered healthy and red foods were unhealthy²⁶. Food and drinks were grouped into 3 categories: (1) Unhealthy Food, (2) Unhealthy Drinks, and (3) Fruits and Vegetables (including frozen) and Healthy Foods. This last category included 4 items for fruits and vegetables as distinct classes based on their

readiness to be eaten and was rated separately from individual fresh fruits and vegetables, described below.

Fresh fruits and vegetables—Eighteen commonly purchased fresh fruits and 14 commonly purchased fresh vegetables items were included. Frozen or canned fruits and vegetables were excluded from this list. Scores for this category were total sums of all observed fresh fruit and vegetables.

Electronic media devices—Devices promoting sedentary behavior (e.g., televisions) were recorded as being available (yes or no; operational status was not evaluated) within each room of the entire home. Computers included both desktop and laptop versions and video games included both consoles or hand held devices (except Wii™, given its emphasis on supporting physical activity, though this item was also not included among physical activity items).

Devices or areas in or around the home that promote physical activity—Fifteen devices considered to promote physical activity were recorded as being available in or around the home. Items that are typically used by young children (i.e., non-powered seated toy cars) and items typically used by adults, such as a treadmill, were included. Devices outside the home were included when on the property of the home or within a common area used by the family (for example a swimming pool at an apartment complex).

Prior to conducting the in-home assessment with participants, protocols for HHE were developed and pilot tested in non-participant homes. Revisions to items were made over several iterations in order to identify and refine items with suboptimal agreement. Using written protocols (available from the first author), the lead researcher (RB) completed group training sessions within volunteer homes for reliability training until a minimum standard of 0.61 kappa values (level of indicate *Substantial Agreement*²⁷ between independent coders was reached.

Subjects

Eighty-two families of preschool children between the ages of 2.0 years and 5 years and 11 months were recruited from: 1) a sample participating in a weight loss intervention (during baseline), 2) from the community using a list of families who indicated a willingness to be contacted to participate in research at a local children's hospital, and 3) a recruitment email to employees within a local children's hospital. Families in the obese category were represented across multiple areas of recruitment, including 22 participants from a weight loss intervention and 13 from community and e-mail solicitations. Inclusion criteria for the healthy weight group included the child being between the 15th and 84.99th BMI percentile based on age and sex-referenced growth charts, and both parents below the BMI classification of obese (BMI < 30)¹. Inclusion criteria for the obese group included children with a BMI 95th percentile for age and sex and at least one obese parent (BMI ≥ 30.0). This dyad was recruited because obese children with at least one obese parent are at greater risk of maintaining obesity through childhood and into adulthood²⁸. Children with BMI percentiles less than the 15th percentile and between the 84.99th and 94.99th percentile were excluded in order to avoid very thin children and children who were overweight but not obese. While an initial screening for inclusion criteria for BMI was done by asking the families to self-report parent and child weight and height during the phone recruitment call, at the home visit height and weight measurements were obtained immediately after consenting the family. If families did not meet the BMI inclusion criteria they were considered a screen failure and no additional data were collected. Exclusion criteria across both samples included children with medical conditions known to promote obesity (e.g.,

Prader-Willi syndrome) or taking weight-affecting medications, and parents already enrolled in another weight-control program at time of the assessment. In addition, participating parents and children were required to a) be English-speaking, b) not have a disability or illness that would preclude them from engaging in at least moderate intensity physical activity, and c) live within 50 miles of the university. This study was approved by the institutional review board at Cincinnati Children's Hospital Medical Center and informed consent was obtained.

Measures

Anthropometrics—Child and parent weight and height were measured with standard anthropometric procedures during the home observation. Children and parents were weighed in light clothing without shoes. The scale and stadiometer were calibrated using a standard weight and height rod, respectively, before each home visit. BMI was calculated as kg/m^2 . Children's BMI percentile was calculated using CDC growth charts containing age-specific median, standard deviation, and distribution skewness correction information¹ using the LMS method²⁹.

Demographics—Family background information was collected from a survey that including race/ethnicity, age, and family income.

Home Health Environment (HHE)—Four trained coders completed the HHE assessment through observations of the home environment. A copy of the questionnaire and coding procedures are available by from the first author.

Each HHE food item was first coded on availability in the home. If coded as “no”, then no other rating on this item was completed. If the item was available in the home, then it was then rated on whether the child could reach it. If the item was not within reach, it was marked “no” and the item was complete. If the food item was coded as within reach, it was rated on whether it could be immediately consumed. For each level of the scale (e.g., availability), the total number of items were summed. For sedentary devices, scores were derived from a total frequency count of devices within each room of the house. The total counts of all devices in all rooms were then combined to create a total house score as well as a separate child's room only score. Physical activity devices were counted as a “yes” if they were observed and “no” if not observed.

Procedures

After consenting, parents first completed a demographic questionnaire and a self-report version of the HHE assessment (data not reported herein). A trained research assistant completed the Home Health Environment observation form. A second trained independent coder completed the HHE observation form to assess inter-rater reliability in twenty-two percent of the sample ($N = 18$). Parents were informed that although drawers would be opened to identify media objects, contents of drawers were never touched or moved to minimize invasiveness. In addition, no drawers were opened in “private” areas, including bathrooms and bedroom dressers. Coders checked all areas of the home, rating items room by room including basements, unattached storage areas and yards. The entire home assessment lasted approximately 90 minutes. After all study information had been completed, parents were given a \$20 gift card for their participation.

Statistical Analyses

Inter-rater Reliability—Kappa statistics were conducted for each dichotomous item recorded based by 2 independent coders. Classification of Kappa followed guidelines

indicating .81 to 1.0 = outstanding, .61 to .80 = substantial, .41 to .60 = moderate, .21 to .40 = fair, and less than .21 = poor agreement²⁷. Differences between frequency levels of sedentary devices within the home were analyzed using intra-class coefficients (ICC)³⁰. ICC classifications were categorized as Substantial agreement .81 to 1.0, .61 to .80 Moderate, .41 to .60 Fair, .11 to .40 Slight, and less than .10 as Virtually None³¹. When insufficient variation occurred among ratings, preventing the estimation of Kappa, percentage agreement was calculated. Items with agreement scores below .61 were dropped from the scale and were not further tested within each level of measurement (i.e., *Availability* of physical activity and sedentary devices, and the *Availability*, *Accessibility*, and *Readiness to be Eaten* food based scales). Additionally, if an item was dropped in the *Presence* level, it was removed from the 2 lower order levels, even if the item agreement was above .61 for the lower levels (i.e., *Accessibility* or *Readiness to be Eaten*). This rationalization was based on the hierarchy of levels, in which first it was necessary to reach agreement on whether a food was present. If presence could not be adequately agreed upon, it was not appropriate to evaluate the level of accessibility or readiness to be eaten.

Discriminative Validity—To establish discriminative validity, HHE assessments were examined between obese versus nonobese children. Distributions of HHE and anthropometric scales were all found to be within limits for skewness and kurtosis³², suggesting normality. All scales were analyzed after the deletion of items found to be unacceptable with regard to agreements statistics (i.e., < .60). A multivariate analysis of variance (MANOVA) was conducted, with univariate follow-up tests, to test hypothesis on differences by child weight status for the availability, accessibility, and readiness to be eaten for food and drinks in the home. Independent t-tests and chi-square analysis were conducted to evaluate hypothesized group differences on sedentary or physical activity devices in home and within the identified child's bedroom. All inferential analyses utilized the independent observations of the trained, non-reliability coder using .05 for significance without adjustment, given univariate testing required first achieving significance from a multivariate model.

Results

Sample Characteristics

Thirty-five obese preschool children (*MBMI* percentile = 98.8 (SD=1.21); Mean ages in months = 50.9 (SD=13.3; range = 27–71), 57% male, 86% Caucasian) with at least one obese primary caregiver (maternal *Mean BMI* = 37.4; SD = 8.4) participated. Forty-seven healthy weight preschool children (*Mean BMI* percentile = 53.7; mean age in months = 50.8 (SD = 13.9; range = 24–71 months, 47% male, 96% Caucasian) with no obese caregivers (maternal *Mean BMI* = 23.9; SD = 3.1) participated. The majority of families (90%) reported having at least one other child in addition to a preschool aged child, ranging in ages 2 months to 18 years old. Eighty-four percent of the primary caregivers were mothers and 89% of the sample reported being married. The primary participating caregiver reported the number of hours worked each week ranging from full time (47%) to part time (at least 20 hours; 36.4%), and less than part time (16.7%). A chi-square test showed no statistically significant difference between groups on income classification, parent race/ethnicity, and group (obese and healthy weight) (χ^2 (3, *N* = 81) = 6.8, *P* = .08). The majority of families reported a family income between \$50,000 and \$124,000 (61%), with 13% below \$50,000 and 14% above \$125,000. Independent t-tests between groups across child age, parent age, and sex were all non-significant, *P* < .05.

Inter-rater Reliability

Healthy and Unhealthy Foods and Drinks—Ratings for the *Availability* of items in the home demonstrated all but 4 items were above the acceptable level of inter-rater agreement (i.e., agreement > 0.60). The 4 unacceptable items were sweetened and unsweetened breakfast cereals, fruit drinks, and sport drinks (see Table 1 for specific item estimates). The *Accessibility* of items showed an additional item, hard to open or peel vegetables, was below acceptable agreement levels. *Readiness to be Eaten* showed an additional 7 items were below acceptable levels, including unprepared or already made cakes, regular chips, non-butter crackers, 100% fruit juice, lean meat, and regular butter/margarine. After removal of these 12 items, all food items remaining on the HHE were considered acceptable and ranged from substantial to outstanding level of agreement ²⁷.

Fresh Fruits and Vegetables—The individual fresh fruit and vegetable items across *Availability*, *Accessibility*, and *Readiness to be Eaten* scales were all above the acceptable level of agreement, with the exception of bananas and oranges in the *Readiness to be Eaten* scale (see Table 2 for specific item estimates).

Physical Activity Devices or Play Areas—Agreement for presence rating among eleven of the 15 physical activity items were considered acceptable. The 4 items that were below the cut-off and removed were a jump rope, weight lifting equipment, yoga/exercise mats, and seated cars. See Table 3 for item specific estimates.

Electronic Media Devices—Agreement for presence rating among all electronic media devices were considered acceptable, with agreement for presence of televisions and video game consoles or hand held games in the substantial agreement range. See Table 3 for specific item estimates.

Discriminative Validity

Given the lack of statistical differences between groups based on demographic variables, multivariate analyses were conducted without covariates.

Healthy and Unhealthy Foods and Drinks—A MANOVA for the 3 categories of foods and drinks (Unhealthy Snacks or Foods, Unhealthy Drinks, Fruits and Vegetables and Healthy Foods) was nonsignificant for Group differences based on *Availability* of these items in the home. Given there were no differences on availability, additional scales were not analyzed (i.e., accessibility, readiness to eat). Means (SD) for foods (number of foods per household) are presented in table 4.

Fresh Fruits and Vegetables—A MANOVA for *Availability* of Fresh Fruit and Vegetables showed a significant main effect for Group, Wilks' $\lambda = .89$, $F(2, 79) = 4.65$, $P = .01$, partial $\eta^2 = .10$. Follow-up univariate ANOVA tests for the total number of fresh fruits or fresh vegetables indicated families of obese preschoolers were significantly less likely to have fresh vegetables present in the home compared to healthy weight families [$F(1, 80) = 8.22$, $P = .005$].

A MANOVA for *Accessibility* of Fresh Fruit and Vegetables showed a nonsignificant main effect for Group, Wilks' $\lambda = .93$, $F(2, 68) = 4.46$, $P = .09$, partial $\eta^2 = .07$. As a multivariate trend for significance, follow-up univariate ANOVA tests are reported for the total number of accessible fresh fruits or fresh vegetables which indicated families of obese preschoolers were significantly less likely to have fresh vegetables accessible (i.e., within reach) in the home compared to healthy weight families [$F(1, 69) = 4.94$, $P < .03$]. The accessibility score, by definition, was related in part to the frequency of available items. Items that were

available but not accessible remained in the analyses as a “0” for calculation purposes. A MANOVA for *Readiness to be Eaten* of Fresh Fruit and Vegetables was nonsignificant for group differences ($P > .05$).

Electronic Media Devices—For the overall home, there were no significant differences on the number of computers, televisions, or video games between groups (all $P > .05$; Table 5). However, when examining only the child’s bedroom, a chi-square analysis indicated that a TV was significantly more likely to be located within a child’s bedroom if the preschooler was obese (37.1%) compared to healthy weight preschool children (12.8%), $\chi^2 (4, N = 82) = 88.51, P < .001$.

Physical Activity Devices or Play Areas—Compared to healthy weight preschool children obese children had significantly fewer total number of physical activity devices in their home, $t(79) = -2.00, P < .05$. Comparison’s of individual items showed that only water or snow play equipment was significantly more likely to be available in the healthy weight group compared to the obese group $\chi^2 (1, N = 82) = 9.39, P < .002$. The average number of electronic media devices and the mean percentage of physical activity devices across the healthy and obese households are presented in table 5.

DISCUSSION

This new home observation assessment successfully discriminated between the home food and activity environments of preschoolers of different weight status and their caregivers. Among the food types examined, the availability and trend for accessibility of fresh vegetables best discriminated homes of healthy weight versus obese preschoolers and their family members. This home environment characteristic may positively influence preference and consumption patterns via exposure and modeling of healthy eating behaviors. Indeed, studies of self-reported adolescents’ home environments showed a significant relationship between fruit and vegetable presence and fruit and vegetable intake. Although studies have shown that household income may best predict the presence of more healthful foods, analyses of income showed no significant relationship with any of the foods and drinks across groups³³.

The accessibility of fresh vegetables presents some important consideration with regard to food request cues and safety. While the accessibility of food high in nutrition may provide a visual stimulus for children it would not be recommended to remove caregivers from the process of food selection. That is, just because a young child has access to a fruit or vegetable, parents should still decide if the food is able to be eaten at the time. Moreover, some foods require parent preparation such as grapes and baby carrots for safety concerns and *should be* inaccessible for young children.

The equal presence of unhealthy foods and drinks among 2 distinct groups of families may reflect parental differences in the management of such foods and drinks. Specifically, parenting styles around feeding have been shown to relate to weight status among at-risk populations³⁴. Future investigations, including diversity of race and ethnicity and income, should consider both measurement of the physical food environment as well as the parental management of it with respect to feeding styles to better understand the link between weight status and the home food environment.

Physical activity devices in and around the home may increase opportunities to stay active on a regular basis³⁵. The present study showed that the total number of available activity devices was associated with weight status though only one specific item reliably differentiated between the 2 group (water and snow equipment). The child’s bedroom

appears to be the most important consideration for placement of sedentary devices, notably the presence of televisions according to this study. The present results of obese preschoolers more likely to have a TV in their bedroom empirically support preventive recommendations to keep TVs out of child bedrooms³⁶. Future assessment and refinement and longitudinal focused designs will further clarify the impact of the home activity environment on early growth and development.

Limitations include a single assessment of the home environment. Additional testing with repeated assessments will help determine the stability of foods routinely purchased. Availability of activity and sedentary devices are probably not likely to change over short periods of time (e.g., 2 weeks) and may therefore not be significantly affected by repeated assessments. Further, quantity of items were not assessed (e.g., number of boxes of sweetened cereal) which may have limited variability in responses. Additionally, the relatively small sample size may have limited the ability to detect significant differences. Future research should include larger samples to further explore the trend for greater accessibility of vegetables in families of healthy weight individuals. Families in the obesity group included participants who enrolled in a weight loss study. These families may not generalize to other families with obesity. Further tool development based on the preliminary results reported here will benefit from examining potential differences based on home type (i.e., house, apartment, mobile home) and larger sample sizes as well as including families with greater diversity income and racial/ethnic diversity. Although income levels showed no statistical differences between groups in the present study, income has been found to be a significant predictor of healthy home food environments and remains an important variable to consider during further tool development and refinement²⁵.

Although during training, independent coders were able to achieve reliable coding for all items, there were 4 food and drink items and 4 physical activity items found unreliable, potentially limiting scale development. Given the food items included cereal and fruit drinks it may be important to refine their measurement, including perhaps increased training on reading food labels for sugar and fat content and distinctions between different types of fruit drinks, these items should be considered for retention in subsequent psychometric testing. The Readiness to Eat subscale also proved difficult to reliably assess and will benefit from additional construct development as well as relevancy for certain food items (e.g., unprepared cake mix) and higher levels of required reliability estimates for adequate training to address potential drift in scoring after initial training to reliability. Finally, dietary intake or activity levels were not assessed, preventing a link between environment and specific health behaviors.

Implications for Research and Practice

The home food and activity environment may provide an area of direct intervention for weight management. The authors' prior treatment of preschool obesity utilizing home visitations as part of treatment included the modification of the home environment to support behavioral recommendations^{37,38}. Although the administration of the home assessment described in this paper was used to assess the impact of treatment on the home environment, the assessment had not been validated and could only be considered as preliminary support. The present investigation provides additional psychometric support as a tool to be used in conjunction with treatment studies. Specifically, interventions focused on increasing the availability of fruits and vegetables or removal of TV from a bedroom may benefit from observations of the home to measure objective changes in the home, compared to self-reported surveys which are subject to social desirability concerns³⁹. A notable strength of the present paper was a group of families with measured levels of obesity. Prior work correlating weight and home environment characteristics included inadequate representation of children in the obese category which may have limited the conclusions

drawn from prior investigations. However, additional samples are needed to identify other characteristics with significant differences in racial/ethnic backgrounds, education, and income.

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Table 1

Foods and drink item group and agreement statistics between independent coders for Home Health Environment: Instrument Development. (n=18).

Item Group	Food or Drink Item	Presence Kappa/Percentage Agreement	Accessibility Kappa/Percentage Agreement	Readiness to be Eaten Kappa/ Percentage Agreement
UNHEA	Chocolate and other sweet candy/ candy bars	0.94 *	1.0	.76
UNHEA	Already made cakes, brownies, cookies, muffins (not English), donuts, other breakfast bars, pastries (3g fat/serving <u>OR</u> 7g sugar serving)	0.94 *	.85	.46
UNHEA	Unprepared mixes for cakes, brownies, muffins, cookie dough	0.89 *	.71	.12
UNHEA	Regular chips (e.g., potato chips, corn chips)	0.89 *	.76	.45
UNHEA	Fruit roll-ups or dried fruit	1.00	1.0	1.00
UNHEA	Ice cream or other frozen desserts	1.00	1.00 *	.85
UNHEA	Sweetened breakfast cereals (>6g sugar servings)	0.44	1.0	.77
UNHEA	Frozen/unprepared or cooked/deli bacon, sausage, hotdogs, or bologna	1.00	1.00 *	.88
UNHEA	Butter or margarine	1.00 *	1.00	−0.08
FVHEA	Non-fat cheese or yogurt	1.00	1.00 *	1.0
FVHEA	Frozen/unprepared OR cooked/deli turkey, chicken, fish, or other “extra lean” labelled meat (must be <5g total fat/serving)	0.94 *	1.00 *	.42
FVHEA	Unsweetened breakfast cereals (6g sugar/serving)	−0.07	.66	1.00
FVHEA	Pretzels or baked chips	0.64	.67	.74
FVHEA	Non-butter crackers (must have <2g fat/servings <u>AND</u> < 5g of sugar serving)	0.73	.77	.17
FVHEA	Hard-to open or peel fruits (e.g. fresh bananas, melons)	1.00	1.00 *	--
FVHEA	Easy-to-open/eat fruits (e.g. fresh apples, grapes) – not canned	0.94 *	1.00 *	1.00 *
FVHEA	Hard-to-open or peel veggies(e.g. pumpkin, frozen veg.) – not canned	0.64	−.07	--
FVHEA	Easy-to-open/eat veggies (e.g. baby carrots, pre-cut veggies, bag lettuce)	1.00	1.00 *	1.0
FVHEA	“100% fruit juice”	0.85	.64	.59
UNBEV	Fruit Drinks (not 100% fruit juice)	0.20	1.00 *	.71
UNBEV	Regular sodas	0.85	1.00 *	1.0
UNBEV	Sport drinks (e.g. Gatorade)	0.49	1.0	1.00 *

Item Group	Food or Drink Item	Presence Kappa/Percentage Agreement	Accessibility Kappa/Percentage Agreement	Readiness to be Eaten Kappa/ Percentage Agreement
UNBEV	Regular (whole) or 2% milk	0.89	1.00 [*]	1.00 [*]

UNHEA = unhealthy snack or food; UNBEV = unhealthy drink; FVHEA = fruits, vegetables, or other healthy food or drink.

^{*} Percentage agreement was reported when one coder showed no variability in coding and thus not suitable for kappa calculation.

Bolded estimates are below acceptable levels of agreement.

Table 2

Fresh fruits and vegetables agreement statistics between independent coders for Home Health Environment: Instrument development. (n=18).

FRESH Vegetables	Presence	Accessibility	Readiness to be Eaten
Tomatoes	1.00	1.0	1.00
Corn, sweet	1.00	1.0	1.00
Green beans	0.88	0.86 [*]	1.00
Carrots	1.00	1.0	.92
Lettuce	0.78	0.8 [*]	1.00
Green peas	1.00	1.0	1.00
Cabbage	1.00	1.0	1.00
Broccoli	0.88	0.86 [*]	1.00
Cucumber	1.00	1.0	1.00
Celery	1.00	1.0	.87
Bell peppers	0.67	0.87 [*]	1.00
Spinach	0.77	1.0	1.00
Cauliflower	0.88	1.0	1.00
Asparagus	1.00	1.0	1.00
FRESH Fruits	Presence	Accessibility	Readiness to be Eaten
Bananas	1.00	1.00 [*]	0.33
Oranges	0.89	1.00 [*]	0.00
Apples	0.77	1.00 [*]	1.00
Grapes	0.88	1.00 [*]	1.00
Watermelon	1.00	1.00 [*]	1.00
Grapefruit	N/A	N/A	N/A
Cantaloupes	1.00	1.00 [*]	1.00
Strawberries	1.00	1.00 [*]	1.00
Pineapples	0.85	1.00 [*]	1.00
Peaches	1.00	1.00 [*]	1.00
Plums	N/A	N/A	N/A
Pears	1.00	1.00 [*]	1.00
Nectarines	1.00	1.00 [*]	1.00
Tangerines	0.64	1.00 [*]	0.50 [*]
Honeydew melon	N/A	N/A	N/A
Cherries	N/A	N/A	N/A
Avocados	0.64	1.00 [*]	1.00
Blueberries	0.77	1.00 [*]	1.00

¹ Kappa classifications are between primary and secondary independent coders.

* Percentage agreement between primary and secondary independent coders.

N/A = this food item was not present in the homes for this analysis

Table 3

Physical activity and electronic device agreement statistics on the Home Health Environment assessment (n=18).

Activity Items	Kappa ¹
Bike/trike	1.00
Basketball hoop	0.88
Jump rope	0.56
Sports equipment	0.99
Swimming pool (including kiddie pool)	0.78
Roller skates, skateboard, scooter	0.85
Fixed play equipment	1.00
Home aerobic equipment	1.00
Weight lifting equipment toning devices	0.54
Water or snow equipment	1.00
Yoga/exercise mats	0.56
Exercise, play, recreation room	0.85
Trampoline	1.00
Seated toy cars powered by child's feet on the ground and not motorized	0.44
Hula hoop	0.87
Electronic Devices	ICC²
TVs	0.95
Computer	0.72
Video game player	0.94

¹ Kappa classifications are between primary and secondary independent coders.

² Intraclass Correlation Coefficients between primary and secondary independent coders (two-way mixed effects model, average measures).

Table 4

Mean (SD) number of foods in each category found in healthy weight and obese weight home environments.

	Healthy Weight n = 47	Obese n= 35
Healthy and Unhealthy Foods and Drinks (Availability)		
Unhealthy Snacks/Foods	7.3 (0.76)	7.2 (0.90)
Unhealthy Drinks	1.2 (0.75)	1.1 (0.69)
Fruits and Vegetables and Healthy Foods	6.7 (1.24)	6.2 (1.85)
Fresh Fruits and Vegetables (Availability)		
Fresh Fruits	3.21 (1.79)	3.02 (1.99)
Fresh Vegetables	3.79 (1.85)	2.48 (2.25) *
Fresh Fruits and Vegetables (Accessibility)		
Fresh Fruits	3.29 (1.70)	2.93 (2.19)
Fresh Vegetables	3.55 (1.66)	2.59 (1.97)
Fresh Fruits and Vegetables (Readiness to Eaten)		
Fresh Fruits	2.2 (1.09)	1.8 (1.33)
Fresh Vegetables	2.3 (1.34)	1.8 (0.88)

* $p = .005$; based on follow up tests using univariate ANOVA.

Table 5

Mean number (SD) of devices per home or percentage of homes with sedentary and physical activity devices found in healthy weight and obese weight home environments.

	Healthy Weight n = 47	Obese n = 35
Electronic Devices in the Home		
Televisions	3.6(1.45)	3.7(1.26)
Computers	1.7(0.85)	1.7(0.88)
Video Game Players	2.1(1.67)	1.9(1.50)
TV in Child's Bedroom	12.8%	37.1% ***
Average number of selected PA devices in the home	7.5 (2.0)	6.7 (1.8) *
Physical Activity Devices		
Bike/trike	87.0%	91.4%
Basketball hoop	69.6%	65.7%
Sports equipment	100%	100%
Swimming pool (including kiddie pool)	54.3%	48.6%
Roller skates, skateboard, scooter	67.4%	62.9%
Fixed play equipment	82.6%	77.1%
Home aerobic equipment	67.4%	54.3%
Water or snow equipment	89.1%	60.0% **
Exercise, play, recreation room	82.6%	71.4%
Trampoline	23.9%	20.0%
Hula hoop	30.4%	14.3%

* P < .05;

** P = .002,

*** P < .001; based on follow up tests using univariate ANOVA.