American Dietetic Association

RESEARCH

Research and Professional Briefs

A Brief Dietary Screener: Appropriate for Overweight Latino Adolescents?

JAIMIE N. DAVIS, PhD, RD; MELISSA C. NELSON, PhD, RD; EMILY E. VENTURA, MPH; LESLIE A. LYTLE, PhD, RD; MICHAEL I. GORAN, PhD

ABSTRACT

The objective of this article is to assess whether a brief dietary screener designed to assess fast-food and beverage consumption in a primarily white, adolescent population, is also valid and reliable in an overweight, adolescent Latina population. This screener was developed by the University of Minnesota to assess beverage consumption (nine items) and fast-food consumption (13 items) in normal weight, primarily white adolescents (ages 11 to 18 years). Thirty-five at risk for overweight (body mass index ≥85th percentile) adolescent (ages 14 to 17 years) Latina females were recruited from East Los Angeles, CA, and completed the screener twice, approximately 7 to 14 days apart, during the fall of 2007. Dietary intake was also assessed by 3-day diet records. Spearman correlation and simple κ were employed for test–retest assessment and comparisons between the screener and the records. Test–retest assessment yielded a mean Spearman or κ statistic of 0.49 with 17 of 21 responses being significant ($P<0.05$). Validity was much lower and yielded a κ statistic of only 0.08 and no responses were significant. Although this screener appeared to be a valid and reliable measure to assess beverage and fast-food consumption in a primarily white, adolescent population, it does not appear to be appropriate for an overweight Latina female adolescent population.

J Am Diet Assoc. 2009;109:725-729.

J. N. Davis is an assistant professor, E. E. Ventura is a research assistant, and M. I. Goran is associate director and professor, all in the Department of Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles. M. C. Nelson is an assistant professor and L. A. Lytle is an associate professor, Division of Epidemiology and Community Health, University of Minnesota, Minneapolis.

Address correspondence to: Jaimie N. Davis, PhD, RD, Department of Preventive Medicine, Keck School of Medicine, University of Southern California, 2250 Alcazar St, Building CSC, Suite 200, Los Angeles, CA 90033. E-mail: jaimieda@usc.edu

Manuscript accepted: August 6, 2008.

0002-8223/09/10904-0016$36.00/0

doi: 10.1016/j.jada.2008.12.025

The prevalence of obesity continues to rise in children and adolescents. According to *National Health and Nutrition Examination Survey* 2003-04 data, in the last 3 decades the prevalence of overweight among adolescents has more than tripled, going from 5% to 17% (1,2). This epidemic is even more pronounced in ethnic populations, and prediabetes and type 2 diabetes have emerged as substantial health issues in overweight adolescents, especially among Latina adolescents (3). We have previously shown that 32% of overweight Latino children in the Los Angeles, CA, area have prediabetes (4,5). We have also previously shown that in this overweight Latino pediatric cohort, total sugar intake, specifically sugar-sweetened beverage intake, was the only dietary variable inversely related to insulin secretion (6) and positively related to adiposity (7).

There is strong evidence to support the negative effects of fast-food consumption and sugar-sweetened beverage intake on pediatric obesity (8,9) and obesity-related metabolic disorders, such as type 2 diabetes (10,11). To date, there are several subjective tools available to assess dietary intake, with food frequency questionnaires, diet records, and 24-hour recalls among the most common. Given that fast-food and sugar-sweetened beverage consumption are emerging as the leading culprits for childhood obesity and related diseases, particularly with Latino youth, it is surprising that there is not a culturally appropriate screener that specifically assesses these foods and beverages. Thus, the purpose of this study is to assess the reliability and validity of a brief screener, which was developed and deemed reliable and valid in a normal-weight, primarily white, pediatric population from the metropolitan area of Minneapolis/St Paul, MN (12) to accurately capture fast-food and beverage consumption in an overweight, Latina, female, adolescent population from Los Angeles.

METHODS

Screener Development and Initial Pilot Testing

The brief screener was adapted, reworded, and expanded upon from previous research conducted in Minnesota in the IDEA (Identifying Determinants of Eating and Activity) cohort study and complete details of the development and pilot testing are outlined in the article by M.C. Nelson and L.A. Lytle (12). In short, the screener included questions on how often beverages and overall fast-food intake were consumed during the past month, with eight response options ranging from never/rarely to three or more times per day. In addition, the screener further probes on the amount consumed of soda and diet soda.

Then yes/no questions for specific types of restaurants are included (eg, traditional hamburger, Mexican, fried chicken).

The reliability and validity of the adapted 22-item screener was established with primarily white adolescents (11 to 18 years old) from the Minneapolis/St Paul metro region. One sample of adolescents completed test–retest of the screener instrument, approximately 7 to 14 days apart (n=33, primarily white), and another sample of adolescents completed the screener questions along with three 24-hour dietary recalls (n=59, white). Test-retest assessments were high, with Spearman correlations and κ statistics that were >0.60, between the two screener administrations. When compared to dietary recall data, the screener items assessing adolescents' intake of regular soda, sport drinks, milk, and water yielded acceptable validity estimates (12).

Table 1. Test–retest reliability of the items included on a dietary screener designed to assess fast-food and beverage consumption in a primarily white adolescent population taken 1 week apart for 35 overweight Latino adolescents

Item	Spearman correlation[a]	Simple κ[a]	*P* value
Beverage frequency			
Regular soda	0.53	—	0.001
Diet soda	0.69	—	<0.0001
Sport drinks	0.65	—	<0.0001
Sweetened beverages	0.37	—	0.027
Milk	0.70	—	<0.0001
Coffee drinks	0.71	—	<0.0001
Beverage amount			
Regular soda	—	0.44	0.0001
Diet soda	—	0.45	<0.0001
Water	—	0.61	<0.0001
Fast food			
Overall frequency	0.49	—	0.003
Fast-food type			
Traditional burger and fries	—	0.45	0.005
Mexican	—	0.58	0.0006
Fried chicken	—	0.49	0.004
Sandwich/subs	—	0.31	0.073
Pizza	—	0.25	0.138
Asian	—	0.51	0.002
Bakery/doughnut shop	—	0.73	<0.0001
Bagel shop	—	0.35	0.038
Coffee shop	—	0.08	0.632
Ice cream and burgers	—	0.57	0.001
Snack bar	—	0.28	0.112

[a]Spearman correlations were used for categorical-response survey items with five or more response categories and simple κ was used for items with fewer than five response categories.

Participants

Participants were a subsample of the Strength and Nutrition Outcomes for Latino Adolescents (SANO LA) study, which is part of the Transdisciplinary Research on Energetics and Cancer (TREC) initiative (a multicenter effort to study and prevent obesity and cancer). SANO LA was a 16-week nutrition and strength training intervention study to reduce obesity and type 2 diabetes risk factors in overweight Latino adolescents from East Los Angeles, CA. Study participants were required to meet the following inclusion criteria: (a) grade 9 thru 12 (14 to 18 years old); (b) body mass index ≥85th percentile for age and sex based on the Centers for Disease Control and Prevention guidelines (13); and (c) Latino ancestry (all four grandparents of Latino origin as determined by parental self-report). Participants were ineligible if they were taking medications known to affect dietary intake, body composition, or insulin dynamics, had syndromes or diseases known to affect body composition or fat distribution, had any major illness since birth, or were pregnant. Prior to any testing procedure, informed written consent from parents and assent from the children were obtained. The Institutional Review Board of the University of Southern California, Health Sciences Campus, approved this study.

Analyses

Participants completed the screener while at the General Clinical Research Center (GCRC). Participants returned to the GCRC approximately 1 week later (mean 7±3.7 days) and completed the screener for a second time in order to assess test–retest reliability. In subsequent data analyses, test–retest reliability of screener items was evaluated using a combination of: (a) Spearman correlation coefficients (for categorical-response survey items with five or more response categories) and (b) simple κ coefficients (for items with fewer than five response categories).

At the baseline visit, participants were also given 3-day diet records (2 weekdays and 1 weekend) to complete at home before their next GCRC visit. Dietary technicians, trained and supervised by a registered dietitian, instructed participants on how to accurately complete diet records. At the second GCRC visit, technicians clarified the dietary records. Data were analyzed using the Nutrition Data System for Research (version 5.0_35, 2007, University of Minnesota, Minneapolis). Beverage consumption was obtained using Nutrition Data System for Research–specified beverage subgroup classifications, while study investigators had to average restaurant/shop names by fast-food type (eg, "burger and fries," Mexican, fried chicken), in order to correspond with possible options provided in the screener items.

To assess the validity of the screener, which reflects intake during the month, to that of the diet records, which reflects intake over 3 days, we divided beverage and fast-food intake frequencies into tertiles. Given that all variables examined in the validity analyses had a small number of response categories (ie, three to four), validity was evaluated using only simple κ coefficients. By assessing relatively "high," "moderate," and "low" consumers via each tool, a more appropriate comparison was possible. Post-hoc analyses were used to explore possible differential misclassification of tertile rankings (eg, where the screener systematically overestimates tertile ranking compared to the recalls or vice versa).

Table 2. Validity analysis of a dietary screener designed to assess fast-food and beverage consumption in a primarily white adolescent population divided into tertiles compared to the 3-day diet records for 35 overweight Latino adolescents

Item	Simple κ[a]	*P* value	No. of subjects who reported consumption in records
Beverage frequency (tertiles)[b]			
Regular soda	0.07	0.55	23
Diet soda	—	—	2
Sport drinks	—	—	4
Sweetened beverages	0.08	0.50	16
Milk	0.18	0.14	26
Coffee drinks	—	—	0
Beverage amount			
Regular soda	0.01	0.89	23
Diet soda	—	—	2
Water	0.08	0.35	33
Fast food (tertiles)[b]			
Overall frequency	0.08	0.53	24
Fast-food type			
Traditional burger and fries	—	—	7
Mexican	—	—	2
Fried chicken	—	—	1
Sandwich/subs	—	—	3
Pizza	—	—	2
Asian	—	—	2
Bakery/doughnut shop	—	—	1
Bagel shop	—	—	0
Coffee shop	—	—	0
Ice cream and burgers	—	—	1
Snack bar	—	—	0

[a]Simple κ was used to assess validity between screener and food record items. Stable estimates for validity were not possible for diet soda, sport drinks, and coffee and all of the specific fast-food types because fewer than 10 participants reported consuming foods at any of these types of restaurants at least once a day within the 3-day period.
[b]Beverage and fast food intake frequencies from both the screener and food record items were divided into tertiles.

RESULTS AND DISCUSSION

Reliability and Validity Testing

Spearman and κ statistics ranged from 0.08 to 0.73, with the mean of 0.49 ± 1.7 (Table 1), indicating a moderate level of agreement according to Landis and Koch (14). Seventeen of the 21 test–retest comparisons were statistically significant ($P<0.05$).

Overall mean κ statistic for validity testing was only 0.08 ± 0.06 and none of the item responses were significant (see Table 2). This level of agreement is considered poor (14). It was not possible to generate stable estimates for validity for diet soda, sport drinks, coffee, and all of the specific fast-food types because fewer than 10 participants reported consuming foods at any of these types of restaurants at least once a day within the 3-day period.

There were no statistically significant misclassifications when assessing agreement in tertile rankings between reported intakes on the 3-day diet records vs the screener for soda, milk, other sweetened beverages, and fast food (data not shown). Post hoc analyses examining differential misclassification of tertile rankings by the screener vs 3-day records shows that the range of congruent classification was from 37% (for soda) to 49% (for milk). Although not statistically significant, the screener did appear to overestimate compared to the records for soda (40.0% vs 22.9%) and sweetened beverage intake (35.3% vs 23.5%).

We hypothesized that our testing would reveal a reliable and valid screener, which could be used to capture problematic dietary variables and rank study participants across TREC centers and populations. The brief dietary screener, developed by the University of Minnesota, was found to be reliable and valid in a primarily white adolescent population (12). However, when we tested the screener, using similar methods and statistics, but in an overweight Latina adolescent population, we found that the screener had moderate reliability for test–retest and poor validity when compared to 3-day diet records.

There are several possible explanations for why the screener was shown to be valid and reliable in the white population, but did not fare as well in our Latina population. Cultural differences with regard to food consumed and options on the screener could have contributed to the inconsistent validity results. Numerous adult studies have found that food frequency questionnaires are less valid in minority populations compared to white populations (15-17). Fewer studies have assessed the validity across ethnicities in pediatric populations. One study by Jensen and colleagues (18) showed that a food frequency questionnaire to measure calcium intake was much less valid in Hispanic youth (10 to 18 years) compared to white youth. Another study found much lower validation coefficients in Hispanic and African-American youth (7th and 8th graders) compared to their white counterparts (19). For our study, it is possible that the beverage and fast-food options included on the screener were not culturally relevant.

Another possible explanation to consider is the lower socioeconomic status (SES) of the Latina population compared to the high SES of the primarily white population from Minneapolis. It is unclear whether SES has an effect on dietary reporting, especially in children. One study by Price and colleagues found that lower SES levels during childhood are associated with underreporting energy intake in adulthood (20); however, the effect of underreporting during childhood was not examined. In contrast, a study by Bandini and colleagues that compared energy intake from 7-day diet records to doubly labeled water ($2H_2O$ H_218O) techniques in 109 preadolescent girls showed that income level was not significantly related to the accuracy of reporting (21).

The educational or literacy level of our sample should also be considered. Although the adolescents from both sites were in similar grade levels, high schools in the Los Angeles School District have historically poor academic performance levels and low literacy levels (22). Several adult studies have shown that lower levels of education are associated with underreporting (23-25). This finding is not surprising, given that most methods of recording food intake are dependent on literacy level. Maintaining day-to-day records of dietary intake may be easier for

low-literacy youth, particularly in comparison to having to estimate usual dietary intake during the past month (as is required by the screener).

In addition, there were some differences in the criterion measure used in the two studies. In our study, we used 3-day diet records for the validity analysis, whereas three 24-hour dietary recalls were used in the Minnesota sample. A review study by McPherson and colleagues on dietary-assessment methods among school-aged children showed that food records underestimated energy intake compared to doubly labeled water, whereas 24-hour recalls had higher agreement compared to direct observation (26). Completion of diet records may be more dependent on the literacy level of the child compared to the completion of 24-hour recalls. Interactive 24-hour recalls do not require a child to write down what they eat, and they include standardized prompting with regard to how foods are prepared, portion size, and where foods were consumed. Given the low literacy level of our Latina population, use of three 24-hour recalls may have improved validity.

There are a couple limitations that need to be addressed. First, this study includes a relatively small sample size (n=35) and includes only females. This validation study was a secondary analysis and began after initiation of the SANO LA intervention study. Therefore, the reliability and validity of this screener was only tested in a female subsample. But the homogeneity of this sample, all overweight Latina female teens, could also be considered a strength because it allows the screener to be tested in a very specific, high-risk population. However, because only 56% of the Minnesota sample was female, this could, in part, explain the differences in validity findings. Numerous studies have shown that females underreport to a greater extent compared to males (23,24), and especially for foods that are perceived as socially unacceptable (eg, sweets and junk food) (27,28), which were the items specifically probed for on the screener. Thus, sex differences could have contributed to the inconsistent validity results between the two samples.

CONCLUSIONS

Our results suggest that nutritional assessment tools need to be developed by starting with formative assessment, determining the most culturally relevant foods for the diet concern and target population. More research should be conducted to make sure that the foods included and the format of the screener are acceptable for the population of interest. Other ways to improve validity include: (a) using more dietary record days to establish criterion validity, especially given the sporadic nature of dietary behaviors; (b) using a larger sample with both sexes; and (c) using a criterion test that is not dependent on reading level. Additional research is needed to develop and test brief dietary screeners in all types of populations, particularly low-income, high-risk minority youth.

This work was supported by the University of Southern California Center for Transdisciplinary Research on Energetics and Cancer (U54 CA 116848), the University of Minnesota Center for Transdisciplinary Research on Energetics and Cancer (U 54 CA 116849), and NICHD (RO1 HD/HL 33064).

We would like to thank project manager Christina Ayala, MPH, and the SANO LA team for the facilitation of the study visits as well as the nursing staff at the GCRC. In addition, we are grateful for our study participants and their families for their involvement.

References

1. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA.* 2006;295:1549-1555.
2. Ogden C, Flegal K, Carroll M, Johnson C. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA.* 2002;288:1728-1732.
3. Rosenbloom AL, Joe JR, Young RS, Winter WE. Emerging epidemic of type 2 diabetes in youth. *Diabetes Care.* 1999;22:345-354.
4. Cruz ML, Weigensberg MJ, Huang T, Ball GDC, Shaibi GQ, Goran MI. The metabolic syndrome in overweight Hispanic youth and the role of insulin sensitivity. *JCEM.* 2004;89:108-113.
5. Weigensberg MJ, Ball GD, Shaibi GQ, Cruz ML, Goran MI. Decreased beta-cell function in overweight Latino children with impaired fasting glucose. *Diabetes Care.* 2005;28:2519-2524.
6. Davis J, Ventura E, Weigensberg M, Ball GD, Cruz ML, Shaibi GQ, Goran MI. The relation of sugar intake to beta-cell function in overweight Latino children. *Am J Clin Nutr.* 2005;82:1004-1010.
7. Davis JN, Alexander KE, Ventura EE, Kelly LA, Lane CJ, Byrd-Williams CE, Toledo-Corral CM, Roberts CK, Spruijt-Metz D, Weigensberg MJ, Goran MI. Associations of dietary sugar and glycemic index with adiposity and insulin dynamics in overweight Latino youth. *Am J Clin Nutr.* 2007;86:1331-1338.
8. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: A prospective, observational analysis. *Lancet.* 2001;357:505-508.
9. Giammattei J, Blix G, Marshak HH, Wollitzer AO, Pettitt DJ. Television watching and soft drink consumption: Associations with obesity in 11- to 13-year-old schoolchildren. *Arch Pediatr Adolesc Med.* 2003; 157:882-886.
10. Schulze MB, Manson JE, Ludwig DS, Colditz GA, Stampfer MJ, Willet WC, Hu FB. Sugar-sweetened beverages, weight gain, and incidence of type 2 diabetes in young and middle-aged women. *JAMA.* 2004;292:927-934.
11. Schulze MB, Liu S, Rimm EB, Manson JE, Willette WC, Hu FB. Glycemic index, glycemic load, and dietary fiber intake and incidence of type 2 diabetes in younger and middle-aged women. *Am J Clin Nutr.* 2004;80:348-356.
12. Nelson MC, Lytle LA. Development and evaluation of a brief screener to estimate fast-food and beverage consumption among adolescents. *J Am Diet Assoc.* 2009;109:730-734.
13. Centers for Disease Control and Prevention. *CDC growth charts*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2000 (U.S. Publ. no. 314).
14. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33:159-174.
15. Stram DO, Hankin JH, Wilkens LR, Pike MC, Monroe KR, Park S, Henderson BE, Nomura AM, Earle ME, Nagamine FS, Kolonel LN. Calibration of the dietary questionnaire for a multiethnic cohort in Hawaii and Los Angeles. *Am J Epidemiol.* 2000;151:358-370.
16. Liu K, Slattery M, Jacobs D Jr, Cutter G, McDonald A, Van Horn L, Hilner JE, Caan B, Bragg C, Dyer A. A study of the reliability and comparative validity of the cardia dietary history. *Ethn Dis.* 1994;4: 15-27.
17. Coates RJ, Monteilh CP. Assessments of food-frequency questionnaires in minority populations. *Am J Clin Nutr.* 1997;65(suppl): 1108S-1115S.
18. Jensen JK, Gustafson D, Boushey CJ, Auld G, Bock MA, Bruhn CM, Gabel K, Misner S, Novotny R, Peck L, Read M. Development of a food frequency questionnaire to estimate calcium intake of Asian, Hispanic, and white youth. *J Am Diet Assoc.* 2004;104:762-769.
19. Cullen KW, Zakeri I. The youth/adolescent questionnaire has low validity and modest reliability among low-income African-American and Hispanic seventh- and eighth-grade youth. *J Am Diet Assoc.* 2004;104:1415-1419.
20. Price GM, Paul AA, Cole TJ, Wadsworth ME. Characteristics of the low-energy reporters in a longitudinal national dietary survey. *Br J Nutr.* 1997;77:833-851.
21. Bandini LG, Cyr H, Must A, Dietz WH. Validity of reported energy intake in preadolescent girls. *Am J Clin Nutr.* 1997;65(suppl):1138S-1141S.

22. Buckley J, Schneider M, Shang Y. *LAUSD School Facilities and Academic Performance*. 2008. http://www.edfacilities.org/pubs/LAUSD%20Report.pdf. Accessed February 2008.
23. Klesges RC, Eck LH, Ray JW. Who underreports dietary intake in a dietary recall? Evidence from the Second National Health and Nutrition Examination Survey *J Consult Clin Psychol*. 1995;63:438-444.
24. Briefel RR, Sempos CT, McDowell MA, Chien S, Alaimo K. Dietary methods research in the third National Health and Nutrition Examination Survey: Underreporting of energy intake. *Am J Clin Nutr*. 1997;65(suppl):1203S-1209S.
25. Ballard-Barbash R, Graubard I, Krebs-Smith SM, Schatzkin A, Thompson FE. Contribution of dieting to the inverse association between energy intake and body mass index. *Eur J Clin Nutr*. 1996;50:98-106.
26. McPherson R, Hoelscher D, Alexander M, Scanlon K, Serdula M. Dietary assessment methods among school-aged children: Validity and reliability. *Prev Med*. 2000;31(suppl):S11-S33.
27. Grogan SC, Bell R, Conner M. Eating sweet snacks: Gender differences in attitudes and behaviour. *Appetite*. 1997;28:19-31.
28. Schoeller DA. How accurate is self-reported dietary energy intake? *Nutr Rev*. 1990;48:373-379.