American Journal of
Preventive Medicine

RESEARCH METHODS

The Obesity Parenting Intervention Scale: Factorial Validity and Invariance Among Head Start Parents

Roger Figueroa, PhD, MPH, MSc,[1] Jaclyn A. Saltzman, PhD, MPH,[2] Alyssa Aftosmes-Tobio, MPH,[1] Kirsten K. Davison, PhD[1,2]

Introduction: Obesity affects 15.7% of U.S. preschoolers, with higher rates among low-income and Spanish-speaking populations. Food, physical activity, and sleep parenting practices, referred to collectively as obesity-related parenting practices, are linked with children's risk of obesity and are a common target in family-based obesity interventions. Yet, there is no brief, validated measure of obesity-related parenting practices that is appropriate for use in intervention studies and for diverse audiences. This study tests the factorial validity of a brief measure of obesity-related parenting and measurement invariance of the English and Spanish versions of the scale, as well as among mothers and fathers.

Methods: Parents of children enrolled in Head Start (n=578; 500 mothers and 78 fathers) completed a brief survey of food (7 items), physical activity (5 items), and sleep parenting (3 items) in fall of 2017 and 2018. Scale items were drawn from existing measures and the evidence base, initially drafted in English, and then translated to Spanish. One parent per family completed the scale independently in English (n=448) or Spanish (n=130). A confirmatory factor analysis framework was adopted to test a 3-factor model for the total sample. Multi-group structural equation modeling was used to assess measurement invariance of the scale by the language of administration (English or Spanish) and among mothers and fathers separately.

Results: Results supported a 3-factor model of obesity parenting with a single factor each for food, physical activity, and sleep parenting. There was statistically significant measurement invariance across all groups (p<0.05). Internal consistency was adequate across factors (α=0.65−0.80).

Conclusions: This brief obesity-parenting scale demonstrates adequate factorial validity in English and Spanish and among mothers and fathers. This measure has been integrated into an intervention, and future work will test sensitivity to change.

Am J Prev Med 2019;57(6):844−852.

INTRODUCTION

Obesity affects 15.7% of U.S. preschoolers,[1] with obesity rates more than twice as high among Hispanic/Latino and African American children compared with their white, non-Hispanic counterparts.[1,2] Parents are gatekeepers to health behavior in early childhood, although research in this topic disproportionally excludes fathers.[3] As a result, family-based prevention strategies that target modifiable obesity-related parenting practices—including food, physical activity, and sleep parenting—have proliferated.[4] In 2013, a transdisciplinary working group of experts in parenting and childhood obesity identified several limitations in measures of obesity-related parenting. Such an effort called for any new measures to be developed with

From the [1]Department of Nutrition, Harvard T.H. Chan School of Public Health, Boston, Massachusetts; and [2]Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health, Boston, Massachusetts

Address correspondence to: Roger Figueroa, PhD, MPH, MSc, Department of Nutrition, Harvard T.H. Chan School of Public Health, 655 Huntington Ave., Building 2, Room 316, Boston MA 02115.
E-mail: rfigueroa@hsph.harvard.edu.

0749-3797/$36.00
https://doi.org/10.1016/j.amepre.2019.08.013

attention toward increasing psychometric validity and cultural sensitivity and limiting participant burden.[5] The investigators emphasized the importance of attention toward brevity to ensure that large-scale studies and interventions can include valid and reliable measures without inducing participant fatigue.[5] Others have pointed out the need for succinct instruments assessing early-life obesity–related behaviors across multiple domains,[6] as well as measures to be validated across cultural and racial/ethnic groups, which require tests of measure invariance.[5,7,8]

Multi-group tests of measurement invariance quantify the degree to which a common factor retains its meaning across different groups using a confirmatory factor analysis (CFA) framework.[9,10] Measurement invariance testing evaluates whether an instrument has the same conceptual and statistical characteristics (e.g., number of factors and items within factors) across different groups, and is critical for measuring constructs among caregivers with diverse characteristics (i.e., parent gender and cultural differences).

Tests of measurement invariance have been applied to the obesity-related parenting practices literature.[11–13] For example, Jansen et al.[14] found that the 28-item Feeding Practices and Structure Questionnaire results were invariant across parent gender. In addition, Davison and colleagues[15] found that the Activity Support Scale for Multiple Groups demonstrated factorial invariance for white and African American parents. However, there are several critical gaps in research remaining. First, most measures of obesity-related parenting practices include more than 10 items,[5] making it more difficult for researchers to utilize these measures in prevention and intervention programs without placing undue burden on participants. Second, few studies have investigated measurement invariance in brief measures of obesity-related parenting practices between parents that speak English and Spanish, as well as among mothers versus fathers.

To address these gaps, this study examines the factorial validity and measurement invariance of 3 brief obesity-related parenting measures, assessing food, physical activity, and sleep parenting, in English and Spanish among low-income parents of preschool-aged children, and among mothers and fathers. To answer this research question, 5 aspects of measurement invariance (dimensional, configural, metric, scalar/strong, and residual/strict invariance) are examined in a CFA framework. It was hypothesized that dimensional, configural, and metric invariance would be established across all groups (i.e., Spanish- and English-speaking groups and mothers compared with fathers). However, some measures may not demonstrate scalar and residual invariance in Spanish- and English-speaking groups given previously reported higher levels of pressuring/indulgent feeding practices among Latino parents.[16]

METHODS

Study Sample

This study utilized baseline data from a clinical trial (NCT03334669; R01DK108200),[17] which was reviewed and approved by the ethics board at Harvard T.H. Chan School of Public Health. The clinical trial focuses on childhood obesity prevention among low-income families with preschool-aged children using community-based participatory research principles. As described in the intervention protocol, baseline data were compiled across multiple sources (i.e., Parents Outcomes Survey and demographic data of participants).[17] This study focused on survey data from the Parents Outcomes Survey, which were collected from a subsample of eligible families during 2017 and 2018.

Parents or primary caregivers (one per family) of children aged 3–5 years enrolled in Head Start were recruited to complete the survey between September and November 2017 and October and December 2018. Families were recruited from Head Start programs in the greater Boston area. Boston Head Start, overseen by Action for Boston Community Development, has a total of 12 programs serving approximately 1,600 children each year. Cambridge/Somerville Head Start, overseen by Community Action Agency of Somerville, is smaller with 4 programs and serves nearly 250 children each year. Parents were recruited from all programs to ensure that the demographics of the resulting sample were similar to the families served across both programs.

All participants provided informed consent before completing the brief survey (15–20 minutes; approximately 65 items). A trained research assistant administered the survey in person to parents in English or Spanish. Survey items from the Parents Outcomes Survey measured secondary outcomes of the intervention trial (i.e., parent health behaviors, parenting efficacy, obesity-related parenting practices, perception of child weight, and parent empowerment). This study focused on the items measuring obesity-related practices including food, physical activity, and sleep parenting. Survey items were drawn from existing validated (English) scales. A native speaker from the same ethnic and racial background of most of the study sample translated the instruments to Spanish. Two research assistants, who are fluent in Spanish, revised translations independently. A team consensus approach was used for clarity and to validate the Spanish version that was utilized moving forward. Appendix Table 1, available online, describes the source and number of items used for each parenting practice.

Measures

Food parenting items were drawn from 2 subscales of the Comprehensive Feeding Practices Questionnaire, both of which have demonstrated reliability and validity across cultures in previous studies.[18–21] The selected items (n=7) corresponded to 2 domains of food-related practices including food as a reward or punishment for child behavior (e.g., offering the child their favorite food in exchange for good behavior; 3 items) and home food environment (e.g., keeping sweets or healthy foods in the house; 4 items). These domains were selected because of their consistent links

with poor dietary outcomes in children and because they were targeted in the larger intervention.[22–24]

Five items from the Activity Support Scale for Multiple Groups were used to denote physical activity–related parenting practices.[15,25] Prior studies support the reliability and validity of this scale.[15,26] Items corresponding to 2 of the 3 domains were selected, including physical activity modeling and logistic support for physical activity. As with the food parenting scale, these domains were selected because they are linked consistently with child physical activity and were targeted in the intervention.[27]

Sleep parenting was measured using 3 items. In the absence of a comprehensive, validated measure of sleep parenting, items were developed by the senior author and colleagues based on evidence-based sleep routines in the literature.

Information on family demographic factors (respondent sex, education, race, ethnicity, and birthplace) was extracted from Head Start records as mentioned previously.

Statistical Analysis

Upon establishing sufficient power to conduct the analyses (i.e., >15 cases per indicator),[28–30] analyses were conducted in Stata, version 14 between October 2018 and June 2019. Preliminarily, descriptive statistics at the univariate level were assessed for each item in all 3 scales. Subsequently, utilizing a CFA framework and multi-group tests of factor invariance using structural equation modeling, the research team examined factorial validity of a brief measure of obesity-related parenting practices and the extent to which the scales were conceptually and statistically similar in English and Spanish, as well as among mothers and fathers.[9,10] Given the goal of developing a brief measure appropriate for use in intervention studies, the research team tested a single factor model for each parenting dimension (i.e., food, physical activity, and sleep parenting).

Analyses proceeded systematically in 5 stages as summarized in Appendix Figure 1, available online. Briefly, in Stage 1, the research team tested whether the hypothesized 3-factor model was supported across the total sample (dimensional invariance). In Stage 2, tests assessed whether the same items were associated with each of the hypothesized factors across groups, that is, for each group (configural invariance). In Stage 3, tests evaluated the degree to which the standardized factor loadings were equal across groups (metric invariance). In Stage 4, tests examined the degree to which intercepts for each factor were equal across groups if criteria for metric invariance were met (scalar or strong invariance). Finally, in Stage 5, tests examined the degree to which residuals or error terms for items and factors were equal across groups if criteria for scalar or strong invariance were met (residual or strict invariance).

Model fit was assessed with the root mean square error of approximation, standardized root mean square residual (both absolute measures of fit), and the Comparative Fit Index (incremental measure of fit).[31] Acceptable model fit was indicated if at least 2 of the following model fit indicators met criteria: a root mean square error of approximation ≤0.08, standardized root mean square residual ≤0.10, and Comparative Fit Index ≥0.90. In addition, minimal changes in at least 2 model fit indicators were used as cut points for meeting factorial invariance stages of analysis continued (i.e., Δ Comparative Fit Index = 0.015; Δ root mean square error of approximation = 0.015; Δ standardized root mean square residual <0.030 [for metric invariance], 0.015 [for scalar and strict invariance]).[10] Lastly, summary statistics and Cronbach's α were used to examine the internal consistency of the final indicators composing the food, physical activity, and sleep parenting dimensions.

RESULTS

The study sample (n=578) consisted of 500 mothers and 78 fathers. Of these parents, 448 completed the scale in English and 130 completed it in Spanish. Among parents who completed the scale in English, more than half identified racially as black or African American and slightly more than a quarter identified as Asian (13%) or white. With reference to their ethnicity, 82% identified as non-Hispanic. Of the parents who completed the scale in Spanish, 85% identified ethnically as Hispanic/Latino and >95% reported other for race. Most parents reported that they completed some college or an Associate's degree and were aged between 35 and 59 years. Additional demographic characteristics are reported in Table 1.

Table 2 summarizes results from the hierarchical stepwise procedure to assess measurement invariance for each of the abbreviated obesity-related parenting scales. In Stage 1, the hypothesized 3-factor model was supported across the total sample as determined by adequate model fit. During Stage 2, the hypothesized 3-factor model was supported across all groups (i.e., English- and Spanish-speaking groups and mothers compared with fathers) also as determined by adequate model fit. In this stage, selected items from the food (3 items) and physical activity parenting (2 items) dimensions were removed from the analysis because of low ($\beta \leq 0.40$) factor loadings as well as low variance. All items from the sleep parenting were retained. At the conclusion of Stage 2, the final model included 4 items in the food parenting dimension (3 items were omitted), 3 items in the physical activity parenting dimension (2 items were omitted), and 3 items in the sleep parenting dimension (all items were retained; noninvariant construct).

From Stage 3 through Stage 5, CFA results supported a 3-factor model of obesity-related parenting with a single factor each for food parenting, physical activity parenting, and sleep parenting. There was statistically significant measurement invariance (p<0.05) for the English and Spanish versions of items measuring food (metric invariance), physical activity (scalar invariance), and sleep-related parenting practices (metric invariance). There was also statistically significant measurement invariance (p<0.05) for items measuring food (scalar invariance), physical activity (scalar invariance), and sleep-related parenting practices (residual invariance) among mothers and fathers. The final

Table 1. Demographic Characteristics of Study Participants

Characteristics	Total sample (*N*=578)	English group (*n*=448)	Spanish group (*n*=130)	Mothers (*n*=500)	Fathers (*n*=78)
Age (mean, *SD*)	33.56 (±7.47)	34.14 (±7.15)	33.90 (±7.22)	33.30 (±6.59)	40.44 (±8.53)
Sex (*n*, %)					
Male	78 (15.95)	65 (14.50)	13 (10.00)	—	—
Female	500 (84.05)	383 (85.50)	117 (90.00)	—	—
Education (*n*, %)					
HS diploma or less	357 (61.76)	264 (58.92)	93 (71.53)	315 (63.00)	36 (46.15)
Some college/associates degree	131 (22.66)	109 (24.33)	18 (13.84)	121 (24.20)	10 (12.82)
4-year college degree or above	70 (12.11)	54 (12.05)	16 (12.30)	58 (11.60)	11 (14.10)
Race, (*n*, %)					
Asian	38 (6.57)	34 (7.58)	0 (0)	29 (5.76)	9 (11.53)
Black	249 (55.58)	248 (55.35)	1 (<1)	215 (42.74)	31 (39.74)
White/Caucasian	56 (9.68)	51 (11.38)	5 (3.84)	50 (9.94)	6 (7.69)
Other[a]	136 (23.52)	103 (21.43)	116 (89.23)	117 (23.26)	19 (24.35)
Ethnicity, (*n*, %)					
Hispanic/Latino	222 (38.40)	95 (21.20)	127 (97.69)	208 (41.35)	14 (17.94)

Note: Because of missing data, some categories may not sum to 100% of study sample.
[a]Other category includes parents who identified as biracial/multiracial, as well as descendants of people from various Latin-American countries (i.e., Brazil, Colombia, Dominican Republic, Guatemala, Haiti, El Salvador, and Puerto Rico), China, Ethiopia, Morocco, and Somalia, among others.
HS, high school.

factor structure and factor loadings for each parenting dimension of the Obesity Parenting for Intervention (OPTION) scale can be found in Figure 1.

Table 3 describes internal consistency for each factor (Cronbach's α) as well as summary statistics for each item in the final factor structure. There was adequate internal consistency across physical activity and sleep indicators within each of their respective dimensions across groups (α=0.69–0.84), although internal consistency in the food factor was less ideal in some groups (α=0.63–0.68).

DISCUSSION

Obesity-related parenting practices are critical components of obesity prevention efforts, but measurement limitations persist.[5] Developing validated assessments is imperative to effectively documenting change in parenting behaviors that may result from interventions. This study tests the factorial validity of a brief measure of obesity-related parenting in a sample of low-income parents of preschool-aged children and factorial invariance of the English and Spanish versions of the scale, as well as among mothers and fathers. A brief obesity parenting scale was developed, which can be referred to as the OPTION scale. The authors named the scale to facilitate presentation of the results. The OPTION scale demonstrated factorial invariance in English and Spanish, as well as among mothers and fathers. Adequate reliability was found across groups in physical activity and sleep parenting dimensions, but limited reliability in the food parenting dimension. Findings from this study suggest that the measure demonstrates cross-group validity and can be interpreted similarly for diverse audiences.

Validation studies assessing measurement invariance in obesity-related parenting practices have been limited by disciplinary siloing. That is, each obesity-related parenting dimension is assessed with a different measure and reported in a different literature. This study is one of the first to rigorously test the factor structure of food, physical activity, and sleep parenting measures appropriate for use in intervention research in English and Spanish and among mothers and fathers. Systematic review evidence suggests that most studies on obesity-related parenting (i.e., food and physical activity) assess scale reliability by reporting Cronbach's α or an equivalent measure of internal consistency (e.g., inter-item correlations or factorial validity), but they fail to assess factorial invariance.[8,32] Similarly, a handful of studies have looked at psychometric properties of sleep parenting measures but only include indicators on addressing children's sleep in a clinical context, not focusing on prevention.[33–35]

There is a substantial literature investigating obesity-related parenting dimensions among low-income and ethnic minority groups.[8,15,18,36–42] Although measures of these have been developed and validated in English[8,15,32,36] and Spanish,[37,38,42] little research has investigated the validity and reliability of measures of obesity-related parenting practices across cultural groups (i.e., white non-Hispanics and ethnic minorities) through tests of factorial invariance. For example, though the Parenting Strategies for Eating and Activity Scale demonstrates strong content, construct,

Table 2. Tests of Factorial Validity and Measurement Invariance for Abbreviated Obesity-Related Parenting Scales Among English- and Spanish-Speaking Parents and Mothers Compared with Fathers

Tests	CFI	RMSEA (90% CI)	SRMR	Model compared[a]	ΔCFI	ΔRMSEA	ΔSRMR	Decision
Stages of invariance testing by language								
M1[b]: food parenting model (baseline)	**0.970**	**0.010 (0.048, 0.157)**	**0.041**	—	—	—	—	Accepted
M2: metric invariance	0.969	0.077 (0.033, 0.122)	0.053	M1	0.001	0.023	0.012	Accepted
M3: scalar/strong invariance	0.928	0.097 (0.063, 0.133)	0.062	M2	0.041	0.020	0.009	Rejected
M1: PA parenting model (baseline)	**0.922**	**0.239 (0.169, 0.317)**	**0.072**	—	—	—	—	Accepted
M2: metric invariance	0.927	0.164 (0.113, 0.219)	0.072	M1	0.005	0.075	0.000	Accepted
M3: scalar/strong invariance	0.930	0.131 (0.088, 0.177)	0.071	M2	0.003	0.033	0.001	Accepted
M4: residual/strict invariance	0.885	0.145 (0.108, 0.184)	0.069	M3	0.045	0.014	0.002	Rejected
M1: sleep parenting model (baseline)	**0.922**	**0.260 (0.189, 0.337)**	**0.071**	—	—	—	—	Accepted
M2: metric invariance	0.907	0.197 (0.150, 0.248)	0.096	M1	0.015	0.063	0.025	Accepted
M3: scalar/strong invariance	0.899	0.168 (0.129, 0.210)	0.098	M2	0.008	0.029	0.002	Rejected
Stages of invariance testing by parent gender								
M1: food parenting model (baseline)	**0.971**	**0.099 (0.047, 0.156)**	**0.034**	—	—	—	—	Accepted
M2: metric invariance	0.976	0.067 (0.019, 0.113)	0.042	M1	0.005	0.032	0.008	Accepted
M3: scalar/strong invariance	0.976	0.068 (0.020, 0.114)	0.043	M2	0.000	0.001	0.001	Accepted
M4: residual/strict invariance	0.617	0.184 (0.158, 0.212)	0.149	M3	0.359	0.114	0.106	Rejected
M1: PA parenting model (baseline)	**0.930**	**0.229 (0.163, 0.303)**	**0.101**	—	—	—	—	Accepted
M2: metric invariance	0.927	0.165 (0.117, 0.218)	0.099	M1	0.003	0.064	0.002	Accepted
M3: scalar/strong invariance	0.918	0.143 (0.103, 0.186)	0.100	M2	0.009	0.022	0.001	Accepted
M4: residual/strict invariance	0.900	0.137 (0.102, 0.174)	0.104	M3	0.018	0.006	0.004	Rejected
M1: sleep parenting model (baseline)	**0.916**	**0.268 (0.198, 0.346)**	**0.061**	—	—	—	—	Accepted
M2: metric invariance	0.919	0.186 (0.135, 0.241)	0.060	M1	0.003	0.082	0.001	Accepted
M3: scalar/strong invariance	0.922	0.149 (0.107, 0.194)	0.061	M2	0.003	0.037	0.001	Accepted
M4: residual/strict invariance	0.925	0.127 (0.089, 0.167)	0.063	M3	0.003	0.022	0.002	Accepted

Note: Boldface indicates statistical significance ($p<0.01$). N=578; English group, n=448; Spanish group, n=130; mothers, n=500; fathers, n=78.
[a]Model with which changes in model fit statistics are being compared.
[b]Baseline model with freely estimated factor loadings from indicators in the final factor structure.
CFI, Comparative Fit Index; M, model; PA, physical activity; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.

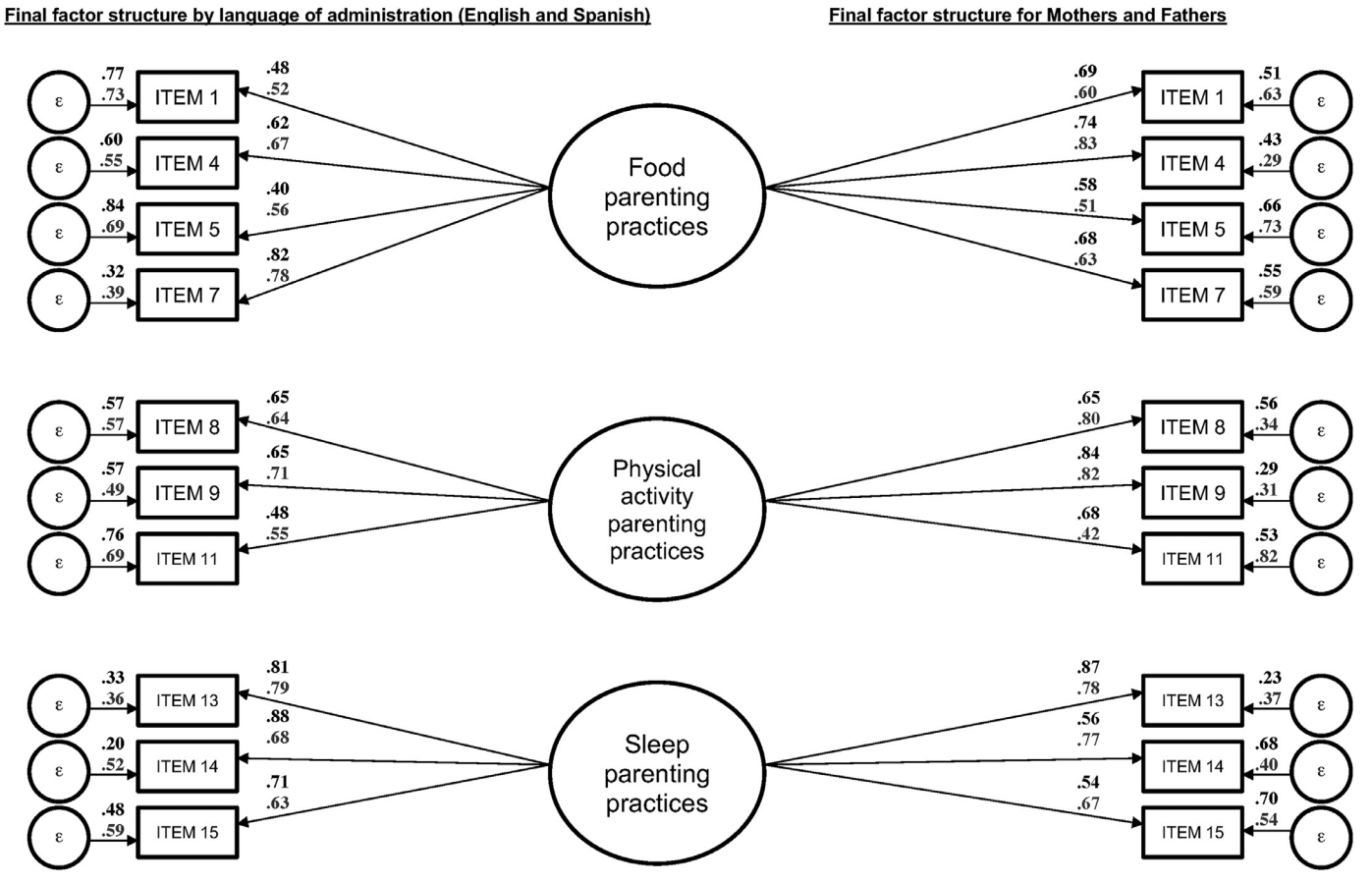

Figure 1. Final factor structure and results from confirmatory factor analysis of brief measures of obesity-related parenting practices for English- and Spanish-speaking parents, and between mothers and fathers. All error loadings (Ɛ) and factor loadings were statistically significant at $p<0.05$. There were 448 participants in the English group (gray) and 130 participants in the Spanish group (black), whereas there were 500 mothers (gray) and 78 fathers (black).

Table 3. Summary Statistics and Internal Consistency Coefficients of the Obesity-Related Parenting Scales Separately for English- and Spanish-Speaking Parents, and for Mothers and Fathers and in the Total Sample

Item description	Total sample, *N*=578	English group, *n*=448	Spanish group, *n*=130	Mothers, *n*=500	Fathers, *n*=78
Food parenting					
1. I offer sweets to my child as a reward for good behavior.	2.12 (0.86)	2.17 (0.86)	1.94 (0.89)	2.13 (0.88)	2.13 (0.80)
4. I keep a lot of snack food (potato chips, Doritos, cheese puffs) in my house.	2.06 (0.78)	2.16 (0.76)	1.80 (0.77)	2.05 (0.76)	2.19 (0.83)
5. I offer my child his/her favorite foods in exchange for good behavior.	2.43 (0.92)	2.38 (0.86)	2.53 (1.09)	2.42 (0.91)	2.53 (0.94)
7. I keep a lot of sweets (candy, ice cream, cake, pies, pastries) in my house.	1.83 (0.71)	1.92 (0.71)	1.51 (0.61)	1.81 (0.70)	1.97 (0.72)
Overall food parenting, mean (SD)	2.11 (0.58)	2.16 (0.58)	1.95 (0.59)	2.10 (0.57)	2.21 (0.60)
Overall food parenting, Cronbach's alpha	0.66	0.68	0.63	0.65	0.71
Physical activity parenting					
8. I exercise, or am physically active, on a regular basis.	2.90 (0.76)	2.93 (0.75)	2.78 (0.81)	2.88 (0.74)	2.94 (0.89)
9. I enjoy exercise and physical activity.	3.04 (0.72)	3.07 (0.69)	2.92 (0.81)	3.01 (0.70)	3.21 (0.78)
11. I take my child to places where he/she can be active.	3.33 (0.62)	3.35 (0.59)	3.27 (0.72)	3.30 (0.62)	3.41 (0.63)
Overall physical activity parenting, mean (SD)	3.09 (0.56)	3.12 (0.55)	2.99 (0.62)	3.06 (0.55)	3.19 (0.63)
Overall physical activity parenting, Cronbach's alpha	0.72	0.73	0.70	0.71	0.75
Sleep parenting					
13. My child goes to bed at about the same time each night.	3.28 (0.69)	3.29 (0.67)	3.25 (0.76)	3.26 (0.70)	3.41 (0.63)
14. My child has a calming bedtime routine (e.g., bath, story, songs).	3.24 (0.67)	3.22 (0.65)	3.31 (0.75)	3.24 (0.68)	3.25 (0.65)
15. My child sleeps in the same room or location each night.	3.41 (0.68)	3.40 (0.66)	3.45 (0.79)	3.39 (0.69)	3.48 (0.65)
Overall sleep parenting, mean (SD)	3.31 (0.57)	3.30 (0.54)	3.33 (0.66)	3.30 (0.58)	3.38 (0.50)
Overall sleep parenting, Cronbach's alpha	0.77	0.75	0.84	0.78	0.69

concurrent validity, and good reliability as a bilingual measure of both food-related and physical activity–related parenting practices,[38] its factorial invariance across English- and Spanish-speaking groups was not tested.

Validation studies of obesity-related parenting practices among mothers and fathers are scarce in the literature. Research suggests that in the context of food, fathers may indeed use extensive food practices similar to mothers.[43] Nonetheless, these practices have been found "conflicting" when comparing fathers' and mothers' practices as a co-parenting unit.[43,44] It is the understanding of the authors that there are no studies assessing factorial validity and measuring invariance among mothers and fathers across food, physical activity, and sleep domains. One recent study did find construct validity and reliability in a new measure of co-parenting feeding practices that is sensitive to both mothers and fathers.[45] Another study assessed reliability of media parenting practices (not examined in this study) among mothers and fathers, which found good internal consistency across four items (α=0.72 and 0.95) but did not assess its construct or factorial validity.[46] In the future, media parenting could be explored in the context of abbreviated measures of obesity parenting practices to build a more parsimonious toolbox of abbreviated parenting practices for obesity researchers.

The strengths of this study include its contribution to the obesity-related parenting measurement science by providing evidence on its validity, reliability, and sensitivity to English- and Spanish-speaking audiences as well as among mothers and fathers. Another strength to this study was assessing measure invariance at every level, as less than half of measurement studies pursue tests of metric, scalar, and residual invariance within the same study (43%).[10]

Limitations

Although the study employed a rigorous approach to evaluating reliability and validity, some limitations should be considered. First, the research team was not able to evaluate whether parameters, factors, or measurement invariance vary over time given the cross-sectional

nature of the data. It is rare, however, that an approach of this kind adopts a longitudinal design in scale development. In addition, this study focuses on low-income parents of young children. Results might differ for higher-income parents and families with older children (although these families are much less likely to be the focus of interventions). Lastly, although the senior author and her colleagues developed most of the items, the research team acknowledges that the food parenting items were drawn from an existing scale.

CONCLUSIONS

The OPTION scale demonstrated factorial validity in English and Spanish and among mothers and fathers, and it also demonstrated moderate reliability. The scale has been integrated into an intervention, and future work will test its predictive validity (i.e., links with children's diet, physical activity, and sleep) and its sensitivity to change.

ACKNOWLEDGMENTS

The authors would like to thank the research team for their efforts throughout the data acquisition, collection, and management process. The National Institute of Diabetes and Digestive and Kidney Diseases (R01DK108200) funded this study. Roger Figueroa (T32DK007703) and Jaclyn Saltzman (R25CA057711) were supported by NIH training grants award to the Harvard T.H. Chan School of Public Health. The research presented in this paper is that of the authors and does not reflect the official policy of NIH.

Portions of this article were presented at the 2019 Society for Preventive Medicine Annual Meeting on March 9, 2019, in Washington, DC.

Roger Figueroa declares that he has no conflict of interest. Jaclyn A. Saltzman declares that she has no conflict of interest. Alyssa Aftosmes-Tobio declares that she has no conflict of interest. Kirsten K. Davison declares that she has no conflict of interest. With regards to funding sources, Roger Figueroa (T32DK007703) and Jaclyn Saltzman (R25CA057711) are supported by NIH training grants award to the Harvard T.H. Chan School of Public Health. The study sponsor had no role at any stage of the development of this manuscript.

The sleep parenting items were developed by Kirsten Davison, Jess Haines, Elsie Taveras, Jennifer Savage Williams, and Kari Kugler.

No financial disclosures were reported by the authors of this manuscript.

SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2019.08.013.

REFERENCES

1. Skinner AC, Ravanbakht SN, Skelton JA, Perrin EM, Armstrong SC. Prevalence of obesity and severe obesity in U.S. children, 1999–2016. *Pediatrics.* 2018;141(3):e20173459. https://doi.org/10.1542/peds.2018-1916.
2. Ogden CL, Carroll MD, Lawman HG, et al. Trends in obesity prevalence among children and adolescents in the United States, 1988–1994 through 2013–2014. *JAMA.* 2016;315(21):2292–2299. https://doi.org/10.1001/jama.2016.6361.
3. Davison KK, Gicevic S, Aftosmes-Tobio A, et al. Fathers' representation in observational studies on parenting and childhood obesity: a systematic review and content analysis. *Am J Public Health.* 2016;106(11):e14–e21. https://doi.org/10.2105/ajph.2016.303391.
4. Ash T, Agaronov A, Aftosmes-Tobio A, Davison KK, Davison KK. Family-based childhood obesity prevention interventions: a systematic review and quantitative content analysis. *Int J Behav Nutr Phys Act.* 2017;14(1):113. https://doi.org/10.1186/s12966-017-0571-2.
5. Baranowski T, O'Connor T, Hughes S, et al. Houston . . . We have a problem! Measurement of parenting. *Child Obes.* 2013;9(S1):S1–S4. https://doi.org/10.1089%2Fchi.2013.0040.
6. Byrne R, Bell L, Taylor RW, et al. Brief tools to measure obesity-related behaviours in children under 5 years of age: a systematic review. *Obes Rev.* 2018;20(3):432–447. https://doi.org/10.1111/obr.12801.
7. Bornstein MH. Cultural approaches to parenting. *Parent Sci Pract.* 2012;12(2–3):212–221. https://doi.org/10.1080/15295192.2012.683359.
8. Vaughn AE, Tabak RG, Bryant MJ, Ward DS. Measuring parent food practices: a systematic review of existing measures and examination of instruments. *Int J Behav Nutr Phys Act.* 2013;10(1):61. https://doi.org/10.1186/1479-5868-10-61.
9. Gregorich SE. Do self-report instruments allow meaningful comparisons across diverse population groups? *Med Care.* 2006;44(Suppl 3):S78–S94. https://doi.org/10.1097/01.mlr.0000245454.12228.8f.
10. Putnick DL, Bornstein MH. Measurement invariance conventions and reporting: the state of the art and future directions for psychological research. *Dev Rev.* 2016;41:71–90. https://doi.org/10.1016/j.dr.2016.06.004.
11. Anderson CB, Hughes SO, Fisher JO, Nicklas TA. Cross-cultural equivalence of feeding beliefs and practices: the psychometric properties of the child feeding questionnaire among blacks and Hispanics. *J Prev Med.* 2005;41(2):521–531. https://doi.org/10.1016/j.ypmed.2005.01.003.
12. Lora KR, Hubbs-Tait L, Ferris AM, Wakefield D. African-American and Hispanic children's beverage intake: differences in associations with desire to drink, fathers' feeding practices, and weight concerns. *Appetite.* 2016;107:558–667. https://doi.org/10.1016/j.appet.2016.09.012.
13. Schmidt R, Richter R, Brauhardt A, Hiemisch A, Kiess W, Hilbert A. Parental feeding practices in families with children aged 2–13 years: psychometric properties and child age-specific norms of the German version of the Child Feeding Questionnaire (CFQ). *Appetite.* 2017;109:154–164. https://doi.org/10.1016/j.appet.2016.11.038.
14. Jansen E, Harris HA, Mallan KM, Daniels L, Thorpe K. Measurement invariance of the Feeding Practices and Structure Questionnaire-28 among a community of socioeconomically disadvantaged mothers and fathers. *Appetite.* 2018;120:115–122. https://doi.org/10.1016/j.appet.2017.08.030.
15. Davison KK, Li K, Baskin ML, Cox T, Affuso O. Measuring parental support for children's physical activity in white and African American parents: the Activity Support Scale for Multiple Groups (ACTS-MG). *Prev Med.* 2011;52(1):39–43. https://doi.org/10.1016/j.ypmed.2010.11.008.
16. Loth KA, MacLehose RF, Fulkerson JA, Crow S, Neumark-Sztainer D. Are food restriction and pressure-to-eat parenting practices associated with adolescent disordered eating behaviors? *Int J Eat Disord.* 2013;47(3):310–314. https://doi.org/10.1002/eat.22189.
17. Beckerman JP, Aftosmes-Tobio A, Kitos N, et al. Communities for healthy living (CHL) – a family-centered childhood obesity prevention program integrated into Head Start services: study protocol for a pragmatic cluster randomized trial. *Contemp Clin Trials.* 2019;78:34–45. https://doi.org/10.1016/j.cct.2019.01.002.

18. Al-Qerem WA, Ling J, AlBawab AQ. Validation of the comprehensive feeding practice questionnaire among school aged children in Jordan: a factor analysis study. *Int J Behav Nutr Phys Act.* 2017;14(1):23. https://doi.org/10.1186/s12966-017-0478-y.
19. Musher-Eizenman D, Holub S. Comprehensive feeding practices questionnaire: validation of a new measure of parental feeding practices. *J Pediatr Psychol.* 2007;32(8):960–972. https://doi.org/10.1093/jpepsy/jsm037.
20. Shohaimi S, Yoke Wei W, Mohd Shariff Z. Confirmatory factor analysis of the Malay version comprehensive feeding practices questionnaire tested among mothers of primary school children in Malaysia. *Sci World J.* 2014;2014:676174. https://doi.org/10.1155/2014/676174.
21. Saltzman JA, Balantekin KN, Musaad S, Bost KK, Fiese BH, STRONG Kids Team. Longitudinal factor analysis of the Comprehensive Feeding Practices Questionnaire among parents of preschool-aged children. *Appetite.* 2018;129:94–102. https://doi.org/10.1016/j.appet.2018.07.006.
22. Birch L, Savage JS, Ventura A. Influences on the development of children's eating behaviours: from infancy to adolescence. *Can J Diet Pract Res.* 2007;68(1):s1–s56.
23. Kiefner-Burmeister AE, Hoffmann DA, Meers MR, Koball AM, Musher-Eizenman DR. Food consumption by young children: a function of parental feeding goals and practices. *Appetite.* 2014;74:6–11. https://doi.org/10.1016/j.appet.2013.11.011.
24. Couch SC, Glanz K, Zhou C, Sallis JF, Saelens BE. Home food environment in relation to children's diet quality and weight status. *J Acad Nutr Diet.* 2014;114(10):1569–1579.e1. https://doi.org/10.1016/j.jand.2014.05.015.
25. Davison KK, Mâsse LC, Timperio A, et al. Physical activity parenting measurement and research: challenges, explanations, and solutions. *Child Obes.* 2013;9(S1):S103–S109. https://doi.org/10.1089/chi.2013.0037.
26. Lampard AM, Nishi A, Baskin ML, Carson TL, Davison KK. The Activity Support Scale for Multiple Groups (ACTS-MG): child-reported physical activity parenting in African American and non-Hispanic white families. *Behav Med.* 2014;42(2):112–119. https://doi.org/10.1080/08964289.2014.979757.
27. Davison KK, Nishi A, Kranz S, et al. Associations among social capital, parenting for active lifestyles, and youth physical activity in rural families living in upstate New York. *Soc Sci Med.* 2012;75(8):1488–1496. https://doi.org/10.1016/j.socscimed.2012.06.002.
28. Lomax RG, Schumacker RE. *A Beginner's Guide to Structural Equation Modeling.* 4th ed. New York: Psychology Press, 2004.
29. Bentler PM, Chou C-P. Practical issues in Structural Modeling. *Soc Method Res.* 1987;16(1):78–117. https://doi.org/10.1177/0049124187016001004.
30. Kline RB. Software review: software programs for Structural Equation Modeling: Amos, EQS, and LISREL. *J Psychoeduc Assess.* 1998;16(4):343–364. https://doi.org/10.1177/073428299801600407.
31. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equ Model.* 1999;6(1):1–55. https://doi.org/10.1080/10705519909540118.
32. Trost SG, McDonald S, Cohen A. Measurement of general and specific approaches to physical activity parenting: a systematic review. *Child Obes.* 2013;9(S1):S40–S50. https://doi.org/10.1089/chi.2013.0027.
33. Ang C-S, Tan J, Fam S, Tan J-P, Fam S-Y. Psychometric properties of the training parenting style scale in a Malaysian sample of adolescents: factor analysis, internal consistency, and measurement invariance. *J Child Fam Stud.* 2015;25(5):1505–1514. https://doi.org/10.1007/s10826-015-0333-1.
34. De la Osa N, Granero R, Penelo E, Domènech JM, Ezpeleta L. Psychometric properties of the Alabama Parenting Questionnaire-Preschool Revision (APQ-Pr) in 3 year-old Spanish preschoolers. *J Child Fam Stud.* 2014;23(5):776–784. https://doi.org/10.1007/s10826-013-9730-5.
35. Esposito A, Servera M, Garcia-Banda G, Del Giudice E. Factor analysis of the Italian version of the Alabama Parenting Questionnaire in a community sample. *J Child Fam Stud.* 2015;25(4):1208–1217. https://doi.org/10.1007/s10826-015-0291-7.
36. Boles RE, Nelson TD, Chamberlin LA, et al. Confirmatory factor analysis of the Child Feeding Questionnaire among low-income African American families of preschool children. *Appetite.* 2010;54(2):402–405. https://doi.org/10.1016/j.appet.2009.12.013.
37. Canals-Sans J, Blanco-Gómez A, Luque V, et al. Validation of the Child Feeding Questionnaire in Spanish parents of schoolchildren. *J Nutr Educ Behav.* 2016;48(6):383–391.e1. https://doi.org/10.1016/j.jneb.2016.03.017.
38. Larios SE, Ayala GX, Arredondo EM, Baquero B, Elder JP. Development and validation of a scale to measure Latino parenting strategies related to children's obesogenic behaviors. The parenting strategies for eating and activity scale (PEAS). *Appetite.* 2009;52(1):166–172. https://doi.org/10.1016/j.appet.2008.09.011.
39. Lusmilasari L, Chaiyawat W, Rodcumdee B. Psychometric properties of the Parental Feeding Behaviours Questionnaire for Indonesian parents of young children. *Int J Nurs Pract.* 2017;24(1):e12604. https://doi.org/10.1111/ijn.12604.
40. Matthews-Ewald MR, Posada A, Wiesner M, Olvera N. An exploratory factor analysis of the Parenting strategies for Eating and physical Activity Scale (PEAS) for use in Hispanic mothers of adolescent and preadolescent daughters with overweight. *Eat Behav.* 2015;19:193–199. https://doi.org/10.1016/j.eatbeh.2015.10.001.
41. Murashima M, Hoerr SL, Hughes SO, Kaplowitz S. Confirmatory factor analysis of a questionnaire measuring control in parental feeding practices in mothers of Head Start children. *Appetite.* 2011;56(3):594–601. https://doi.org/10.1016/j.appet.2011.01.031.
42. O'Connor TM, Cerin E, Hughes SO, et al. Psychometrics of the preschooler physical activity parenting practices instrument among a Latino sample. *Int J Behav Nutr Phys Act.* 2014;11(1):3. https://doi.org/10.1186/1479-5868-11-3.
43. Khandpur N, Charles J, Blaine RE, Blake C, Davison K. Diversity in fathers' food parenting practices: a qualitative exploration within a heterogeneous sample. *Appetite.* 2016;101:134–145. https://doi.org/10.1016/j.appet.2016.02.161.
44. Fielding-Singh P. Dining with dad: fathers' influences on family food practices. *Appetite.* 2017;117:98–108. https://doi.org/10.1016/j.appet.2017.06.013.
45. Tan CC, Lumeng JC, Miller AL. Development and preliminary validation of a feeding coparenting scale (FCS). *Appetite.* 2019;139:152–158. https://doi.org/10.1016/j.appet.2019.04.020.
46. Tang L, Darlington G, Ma DWL, Haines J, Guelph Family Health Study. Mothers' and fathers' media parenting practices associated with young children's screen-time: a cross-sectional study. *BMC Obes.* 2018;5:37. https://doi.org/10.1186/s40608-018-0214-4.