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Confirmatory Factor Analysis of the Infant Feeding Styles Questionnaire in Latino Families

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Abstract

Background—Parent feeding practices affect risk of obesity in children. Latino children are at higher risk of obesity than the general population, yet valid measure of feeding practices, one of which is the Infant Feeding Styles Questionnaire (IFSQ), have not been formally validated in Spanish.

Objective—To validate the IFSQ among Latino families, we conducted confirmatory factor analysis of pressuring, restrictive, and responsive feeding constructs from the IFSQ.

Design/Methods—The IFSQ was administered at the 12-month visit in the Greenlight study, a multi-center cluster randomized trial to prevent obesity. Parents were included if they were of Latino origin (n=303) and completed an English or Spanish language modified IFSQ (without the indulgence construct). Scores from nine sub-constructs of the IFSQ were compared between English and Spanish language versions. We tested reliability with Cronbach's alpha coefficients and performed confirmatory factor analysis to examine factor loadings and goodness of fit characteristics, modifying constructs to achieve best fit.

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Results—Of 303 parents completing the IFSQ, 84% were born outside the US, and 74% completed the IFSQ in Spanish. Reliability coefficients ranged from 0.28–0.61 for the laissez-faire sub-constructs and from 0.58–0.83 for the pressuring, restrictive, and responsive sub-constructs. Results for all coefficients were similar between participants responding to an English and Spanish version of the IFSQ. Goodness of fit indices ranged from CFI 0.82–1 and RMSEA 0.00–0.31, and the model performed best in pressuring-soothing (CFI 1.0, RMSEA 0.00) and restrictive-amount (CFI 0.98, RMSEA 0.1) sub-constructs.

Conclusions—In a sample of Latino families, pressuring, restrictive, and responsive constructs performed well. The modified IFSQ in both English and Spanish-speaking Latino families may be used to assess parenting behaviors related to early obesity risk in this at-risk population.

Keywords

feeding styles; confirmatory factor analysis; infant feeding; Latino

Introduction

Compared with non-Hispanic infants, Hispanic infants have a higher prevalence of weight-for-recumbent length greater than the 95th percentile. Additionally, obesity risk factors in infancy, such as the quality of infant diet and behaviors related to feeding, differ by race/ethnicity.[1–3] When these risk factors are adjusted for, racial/ethnic disparities in childhood obesity are attenuated or disappear.[4] With an increasing focus on preventing obesity, it is important to understand modifiable risk factors for the development of obesity in Latinos, the largest minority population in the United States. One such risk factor is rapid infant weight gain, defined as upward crossing of weight percentiles in the first two years of life, which increases obesity risk in childhood and adulthood, increases cardiovascular, respiratory, and metabolic risk, and may contribute to increases in body fat percentage compared to infants who do not exhibit rapid infant weight gain.[5–13]

Although mechanisms that contribute to rapid infant weight gain and subsequent obesity remain unclear, decisions about the primary mode of feeding (i.e. breastfeeding or bottle feeding) and parental perception of infant hunger likely influence early growth trajectories,[14,15] and parental feeding practices are a critical component to infant and child growth, and might help explain the intergenerational transmission of obesity.[16–18] Theoretical and experimental work to identify, describe, and validate parental feeding practices has led to the development of the Child Feeding Questionnaire (CFQ).[19,20] The CFQ and other valid measures have demonstrated associations between feeding practices and child food intake and weight status, particularly with “restrictive” behaviors that prohibit and control access to certain foods.[21] Older children appear to be acutely aware of previous food restrictions and when in a more permissive environment, may routinely request foods that are being restricted.[22]

The environment of feeding shaping parent-infant interaction likely differs significantly from later childhood by schedule, dietary content, perception of hunger and satiety cues, and the development of desires and demands as children grow. Consideration of the development of feeding practices may be particularly important in early life, as parents

habituate feeding practices, which may or may not be dependent on infant hunger and satiety cues.[23,24] Some aspects of parental feeding practices are likely established in the first months to year of life and may have influences on weight gain in the first year of life or later childhood outcomes.[25–27] For example, highly controlling feeding practices at one year of life are predictive of difficulty with internal cues related to eating behaviors later in life.[25]

Early and reliable identification and modification of parental feeding practices, and parental feeding styles underlying these practices, could contribute to obesity prevention within a critical period during which behavior modification might be more amenable.[28,29] Studying these behaviors in diverse populations is challenging, as much of the initial experimental work and validation occurred among mostly non-Hispanic white, middle- and upper-income families. A few studies have examined low-income African American mothers[30] and Latina mothers,[31] with data suggesting Latinos may be more likely to pressure their infants to finish feeds and less likely to be responsive to feeding cues.[31] As cultural influences differ and play variable roles in parental feeding styles and practices, more routine study of these beliefs and behaviors in Latino populations requires a valid and reliable measure.

Development of the Infant Feeding Styles Questionnaire (IFSQ)[32] was in part a result of the search for a valid and reliable measure of parent feeding beliefs and practices in infancy and early childhood. The IFSQ was initially developed through formative ethnographic research[33,34] and then assessed for construct validity in two samples of African-American mothers attending WIC clinics. The IFSQ assesses beliefs and practices within five parental feeding styles: “laissez-faire” (with sub-constructs of diet quality and attention); “pressuring” (with sub-constructs of pressuring to feed, pressuring with cereal, and pressuring as soothing); “restrictive” (with sub-constructs of diet quality and amount); “responsive” (with sub-constructs of satiety and attention); and “indulgence” (with sub-constructs permissive, coaxing, soothing, and pampering) (Table 1). Indulging and uninvolved feeding styles have been associated with unhealthy nutrient intake in low-income children,[35] and restrictive and pressuring feeding practices were more likely seen in a group of low-income Hispanic infants at high risk for obesity.[36] In a sample of low-income African-American mothers, restrictive feeding style was associated with larger infant size but better infant nutrition, while pressuring style was associated with smaller infant size and more age-inappropriate feeding.[37]

The IFSQ has been used in multiple settings[36,38–41] and has the advantage of assessing parental beliefs and practices, yet whether these constructs are adequately represented or can be reliably measured in English- and in Spanish-speaking Latino families remains unknown. Given potential misinterpretation of questions related to feeding[42] and the documented importance of culture-specific influences on feeding styles among African-Americans,[33,43,44] we aimed to validate model fit of the IFSQ in a large population of low-income, English- and Spanish-speaking Latino families so that we may begin to fill a critical gap in knowledge of this understudied and rapidly growing segment of the US population.

Methods

Sample

The IFSQ was administered to caregivers of children enrolled in the Greenlight study, a cluster-randomized trial of an obesity prevention intervention focused on the first two years of life.[45] The Greenlight study uses a literacy and numeracy-sensitive intervention based on social cognitive theory to target adult caregivers at their child's preventive office visits in the first 2 years of life. Two university clinics were randomized to implement the obesity prevention intervention, which included a series of picture-based low-literacy toolkits to encourage recommended behaviors and a health-communication curriculum for the child's health care provider. Two "active control" sites implemented The Injury Prevention Program (TIPP) curriculum designed by the American Academy of Pediatrics.[46]

The methods of the Greenlight study have been published previously.[45] Briefly, caregivers were eligible to enroll if their infant was between 6 and 16 weeks old at the 2 month baseline visit, had a weight-for-length greater than the 3rd percentile based on WHO growth curves, was born at least 34 weeks gestational age and at least 1500 grams at birth, and did not have a known medical problem affecting growth (e.g. failure to thrive or a metabolic disorder). Caregivers were excluded if they did not speak English or Spanish, were less than 18 years old, had mental, neurological illness or poor vision, or planned to leave the clinic or move within the next 2 years. To focus on validation and model fit for the IFSQ among Latino participants, we limited our sample to caregivers who self identified as Hispanic/Latino. Written and verbal consent were obtained from caregivers according to the institutional review board policies at each of the four sites. The four institutional review boards approved the study, which was registered with the national Clinical Trials Registry (NCT01040897 at clinicaltrials.gov), and a data safety monitoring board monitored study progress.

Measures

Data collected at the 12-month visit included four of the five constructs of the IFSQ ("laissez-faire," "pressuring," "restrictive," and "responsive"). The "indulgence" construct was not used in the Greenlight study due to time limitations. The survey was completed either in person with study personnel at the child's 12 month visit (97%) or shortly after this visit, by phone (3%). The Spanish language version of the IFSQ was developed for the Latino Infant Nutrition Study, translated from English by a native Spanish speaker and then translated back to English, with discrepancies in the versions resolved by the bilingual research team.[47] In brief, the complete IFSQ includes 39 items probing beliefs (scored on a 5-point scale: disagree, slightly disagree, neutral, slightly agree, agree) and 44 items probing behaviors (scored similarly: never, seldom, half of the time, most of the time, always). For the Greenlight study, we collected 51 items (23 probing beliefs and 28 probing behaviors), and the IFSQ was administered in either English or Spanish, based on the caregiver's stated preference. Other measures included in this study included caregiver sociodemographics (age, sex, income, acculturation), self-reported caregiver anthropomorphic measures, and directly-measured child anthropomorphics. Maternal obesity was defined as body mass index >30 kg/m^2 as defined by World Health Organization (WHO) standards. Acculturation

was measured with the Short Acculturation Scale for Hispanics (SASH), with low acculturation considered to be a score <3.[48]

Analysis

Initially, we examined sociodemographic and anthropometric variables of our sample and calculated mean scores, standard deviations, and distributions of each item within the sub-constructs of the four feeding styles and calculated item reliabilities in the overall sample and in the subsets completing the IFSQ in English and in Spanish with Cronbach's alpha coefficients to establish whether further validation was warranted. Based on these results, we performed confirmatory factor analysis for nine sub-constructs of the IFSQ across the four feeding styles. We examined factor loadings and model fit, using this information to iteratively modify models that had poor or marginal fit by eliminating items with non-significant or low factor loadings and/or including covariance between similarly worded items to improve model fit. All modifications were theoretically, not empirically, driven, and overall, few modifications were made. We focused on the nine sub-constructs based on previous work with the IFSQ[19,20] showing that the sub-constructs measure different aspects of infant feeding styles and are differentially associated with child feeding and weight outcomes. We also tested whether second order CFA models, including all the items associated with each feeding style and the covariances between constructs, had better fit in this sample. These models either had poor fit, as was the case with pressuring, or did not converge due to empirical under-identification, occurring when the covariance matrix between the sub-constructs was equal to zero.

A weighted least squares estimator, with items considered categorical, in Mplus version 5 (Muthen and Muthen, Los Angeles, CA) examined model fit for each of the nine sub-constructs, producing several measures of model goodness-of fit: chi-square; root mean square error of approximation (RMSEA); and comparative fit index (CFI). The chi-square test evaluates absolute fit of the model to the data matrix, with larger and statistically significant values indicating poor fit. The RMSEA and CFI, measures of comparative fit, assess the model against a model of "reasonable" fit to the data. Values <0.06 (RMSEA) and >0.95 (CFI) are generally suggested as cutoffs for good model fit, although there are no clear standards for their interpretation.[49] Additionally, we calculated Schwartz's Bayesian Information Criteria (BIC) according to Raftery.[50] This version of the BIC allows comparison of models estimated with weighted least squares estimators. Negative change in BIC between models indicates the preferred model. When combined with the BIC, used in this way as a measure of incremental fit changes between models, the chi-square, RMSEA, and CFI provide a comprehensive evaluation of model fit.

Results

From a total sample of 865 participants enrolled in the Greenlight study, 430 (49.7%) identified as Latino; of these, 303 (70%) had a majority of items collected from the IFSQ. Characteristics including acculturation, language of administration, household income, infant's sex, and infant's weight-for-recumbent length did not differ significantly between those with complete and incomplete IFSQ responses. Sample demographics and

anthropometrics are displayed in Table 2. The majority of caregivers completing the IFSQ were mothers (94%), born outside of the United States (84%), and spoke Spanish as their primary language (74%). Just over half of mothers were born in Mexico, 43% had less than a high school education, 76% were unemployed, and income was below $20,000 per year in 64% of households. Mean acculturation scores were low, defined as a mean of ≤ 2.99, according to scoring of the validated SASH.[48] The mean pre-pregnancy body mass index (BMI) of mothers was 28 kg/m^2 (SD 6), however nearly one-third of mothers were obese as defined by the WHO (BMI> 30 kg/m^2). Mean birth weight of children in the sample was 3.3kg (SD 0.5kg), which represents the 50th percentile of the WHO growth standard of the population. At the 12 month visit, weight-for-length z-score (WFLz) and BMI z score were each 0.43.

Respondents tended to score higher in restrictive and responsive sub-constructs than laissez-faire and pressuring sub-constructs, and overall internal reliability between the pressuring, restrictive, and responsive sub-constructs ranged from 0.63 to 0.83. When examined by language of IFSQ administration, reliability for Spanish language respondents, comprising the majority of the sample, closely resembled overall reliability (Table 3).

Confirmatory factor analysis results for the models of three constructs (pressuring, restrictive, and responsive) and selected modifications including stepwise elimination of items with lower factor loadings and/or addition of error covariance are shown in Tables 4 (overall sample) and 5 (Spanish language sample). The laissez-faire construct displayed poor fit with low Cronbach's alphas (0.44 overall, 0.48 for Spanish-speaking, and 0.55 for English speaking samples) and so CFA was not performed. The individual items and their factor loadings are shown in the Appendix.

Full models of three constructs of the IFSQ (pressuring, restrictive, and responsive) fit well. The pressuring to finish sub-construct had a large and statistically-significant chi-square (150.7, $p<0.001$), although the chi-square is highly dependent on sample size and assumptions of distribution, and in large sample sizes like ours, small discrepancies between the observed and predicted matrices will result in a significant chi-square.[51] We improved the chi-square and other model fit indices by dropping one item (PR5) and adding covariance to include three similarly-worded items ("try to get child to finish breastmilk or formula" and "try to get child to eat even if not hungry" and "if child seems full, encourage to finish anyway"). This modification achieved a better fit, shown by reduced chi-square (53.7, $p<0.001$), a CFI of 0.95, and a negative BIC (−9.15). Similarly, the pressuring with cereal sub-construct was modified by eliminating one item (PR11), which also achieved a high CFI (0.98) and a significant change in BIC from 118 to 0.08. Initial, full models of pressuring soothing, restrictive amounts, and responsive to satiety all fit very well, with small chi-square values (0.7–16.4), low RMSEAs (0.0–0.09) and high CFIs (0.99–1.00). When goodness of fit indices were examined in the subset of the population completing Spanish language surveys (n=215), these showed very similar model fit in all sub-constructs with identical modifications (Table 5).

After initial confirmatory factor analysis showed poor model fit for the laissez-faire construct in this population, this construct was reexamined with exploratory factor analysis.

Initial eigenvalues suggested a two-factor model, which was examined for reliability with the Cronbach's alpha. Despite analyzing as a two-factor model, and dropping items that might have improved the scale's reliability, Cronbach's alpha values remained low (0.26–0.41), and we concluded that the laissez-faire construct of feeding beliefs and behaviors is not reliable in this sample of Latino families.

Discussion

We completed confirmatory factor analysis of the IFSQ in a large sample of mostly Spanish-speaking Latino families, and showed that overall model fit was appropriate for three of four IFSQ constructs collected as a part of the Greenlight study: pressuring; restrictive feeding; and responsive feeding. The fourth IFSQ sub-construct, laissez-faire, did not fit these data. This is the first formal validation of the IFSQ in a Latino population and the first use of the measure with Spanish-speaking participants. The IFSQ has been confirmed to fit well in 150 low-income African American mothers whose children had a mean age 10 months[32] yet there was previously no indication that a tool used earlier in life would be useful in a Latino population that is at potentially higher risk for obesity.

Validation of the IFSQ among Latino caregivers allows expanded use of this tool for Latino population, which is both the most rapidly expanding and highest risk community in the US. Although restrictive infant-feeding practices (i.e. strictly limiting types and amounts of intake) have been most consistently associated with increased child BMI,[21] it is unclear what cultural influences might underlie this association, and so measuring reliable constructs in diverse cultures is important when measuring risk for obesity in early life.[52] Constructs measured in the IFSQ have been examined in other Latino populations. In one population of Hispanic, non-US born, less educated families, restrictive and pressuring feeding constructs from the IFSQ were highly prevalent.[36] Among other studies involving parenting style and feeding, Hispanic participants were more likely to be indulgent (i.e. less demanding and more responsive on a two-dimension framework).[16] Our sample scored highest on the responsive construct (mean 3.97), potentially demonstrating similarities with this previous sample of Hispanic families.

The laissez-faire feeding style construct did not achieve adequate model fit, and when reexamined with exploratory factor analysis, did not appear to form an underlying latent construct in this population of Latino families. It is possible that, among Latinos, culturally-specific wording may not adequately describe behaviors thought to be "laissez-faire," or that differences in wording that are sensitive to translation may have altered the construct's reliability, as the measured Cronbach's alpha values differed significantly between language administration. Additionally, the fact that many families were breastfeeding and not formula-feeding could mean that behaviors like bottle-propping, which is measured within the laissez-faire construct, were not relevant. Others have described challenges with reliability of the laissez-faire construct in Latino families.[47] We suggest that this construct be measured in additional Latino populations, perhaps targeting families choosing to feed with a bottle, to capture beliefs and practices related to bottle-feeding.

Our analysis is limited by the fact that the IFSQ was administered without the indulgence construct, and only once in the Greenlight Study, at the infant's 12-month visit, and recall of several behaviors or beliefs more pertinent to early infancy may not represent current feeding behaviors at one year of life. Additionally, the survey was part of a trial to prevent obesity, which may have resulted in changes to responses at the intervention sites, although few specific components of the IFSQ were addressed by the intervention. Although our sample of Latino participants was generally of low acculturation, there are likely differences in cultural beliefs and behaviors between first and subsequent Latino generations living in the United States, and we did not separately analyze our data by generation. There were not sufficient numbers of English speaking Latino participants to analyze the IFSQ within this subpopulation alone, and although there appear to be no substantive differences between the language of administration and the overall model fit, we did not perform invariance testing to confirm this. Finally, the pressuring as soothing sub-construct may have shown evidence of overfit and should be examined closely in other samples.

The literature suggests that maternal control over feeding appears to have a substantial influence on infant weight gain, and can redirect weight gain patterns, theoretically by either encouraging more intake in smaller infants, or restricting intake in larger infants.[27] As more specific constructs of feeding behaviors and beliefs are measured in more populations and over time, an improving landscape of modifiable behaviors should emerge. Longitudinal assessment of these behaviors, along with weight measurements, is necessary, as there is currently a paucity of longitudinal data.[37,53] If high levels of external control of feeding behaviors (including restriction) early in life are responsible for poor regulation of intake later,[20] then perhaps restrictive behaviors can be discouraged to prevent later problems with feeding behaviors. Now that we have demonstrated good model fit with confirmatory factory analysis for these three feeding styles, differences in weight-for-length and BMI should be examined by feeding style scores to attempt to identify where feeding behaviors might be modified to decrease obesity incidence in Latino families that may already be at greater risk for obesity.

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Abbreviations

IFSQ	Infant Feeding Styles Questionnaire
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation

CDC	Centers for Disease Control and Prevention
CFQ	Child Feeding Questionnaire
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children
WHO	World Health Organization
SASH	Short Acculturation Scale for Hispanics
BIC	Bayesian Information Criteria

References

1. Thompson AL, Bentley ME. The critical period of infant feeding for the development of early disparities in obesity. Social Science & Medicine. 2013; 97:288–296. [PubMed: 23312304]
2. Perrin EM, Rothman RL, Sanders LM, et al. Racial and Ethnic Differences Associated With Feeding- and Activity-Related Behaviors in Infants. Pediatrics. 2014
3. Wen X, Kong KL, Eiden RD, Sharma NN, Xie C. Sociodemographic differences and infant dietary patterns. Pediatrics. 2014; 134(5):e1387–e1398. [PubMed: 25311608]
4. Taveras EM, Gillman MW, Kleinman KP, Rich-Edwards JW, Rifas-Shiman SL. Reducing racial/ethnic disparities in childhood obesity: the role of early life risk factors. JAMA pediatrics. 2013; 167(8):731–738. [PubMed: 23733179]
5. Eid EE. Follow-up study of physical growth of children who had excessive weight gain in first six months of life. British medical journal. 1970; 2(5701):74–76. [PubMed: 5420235]
6. Ong KK, Loos RJ. Rapid infancy weight gain and subsequent obesity: systematic reviews and hopeful suggestions. Acta paediatrica (Oslo, Norway : 1992). 2006; 95(8):904–908.
7. Stettler N, Kumanyika SK, Katz SH, Zemel BS, Stallings VA. Rapid weight gain during infancy and obesity in young adulthood in a cohort of African Americans. The American journal of clinical nutrition. 2003; 77(6):1374–1378. [PubMed: 12791612]
8. Dennison BA, Edmunds LS, Stratton HH, Pruzek RM. Rapid infant weight gain predicts childhood overweight. Obesity (Silver Spring Md.). 2006; 14(3):491–499.
9. Belfort MB, Rifas-Shiman SL, Rich-Edwards J, Kleinman KP, Gillman MW. Size at birth, infant growth, and blood pressure at three years of age. The Journal of pediatrics. 2007; 151(6):670–674. [PubMed: 18035150]
10. Ben-Shlomo Y, McCarthy A, Hughes R, Tilling K, Davies D, Smith GD. Immediate postnatal growth is associated with blood pressure in young adulthood: the Barry Caerphilly Growth Study. Hypertension. 2008; 52(4):638–644. [PubMed: 18768401]
11. Skilton MR, Marks GB, Ayer JG, et al. Weight gain in infancy and vascular risk factors in later childhood. Pediatrics. 2013; 131(6):e1821–e1828. [PubMed: 23713097]
12. Sonnenschein-van der Voort AMM, Howe LD, Granell R, et al.
13. Leunissen RW, Kerkhof GF, Stijnen T, Hokken-Koelega A. Timing and tempo of first-year rapid growth in relation to cardiovascular and metabolic risk profile in early adulthood. JAMA : the journal of the American Medical Association. 2009; 301(21):2234–2242. [PubMed: 19491185]
14. Dewey KG, Heinig MJ, Nommsen LA, Peerson JM, Lonnerdal B. Growth of breast-fed and formula-fed infants from 0 to 18 months: the DARLING Study. Pediatrics. 1992; 89(6 Pt 1):1035–1041. [PubMed: 1594343]
15. Burton P, Wells JC, Kennedy K, Nicholl R, Khakoo A, Fewtrell MS. Association between infant correlates of impulsivity--surgency (extraversion)--and early infant growth. Appetite. 2011; 57(2): 504–509. [PubMed: 21771621]
16. Hughes SO, Power TG, Fisher JO, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. Appetite. 2005; 44(1):83–92. [PubMed: 15604035]

17. Wardle J, Sanderson S, Guthrie CA, Rapoport L, Plomin R. Parental feeding style and the intergenerational transmission of obesity risk. Obesity Research. 2002; 10(6):453–462. [PubMed: 12055321]
18. Baughcum AE, Powers SW, Johnson SB, et al. Maternal feeding practices and beliefs and their relationships to overweight in early childhood. Journal of Developmental and Behavioral Pediatrics. 2001; 22(6):391–408. [PubMed: 11773804]
19. Birch LL, Fisher JO, Grimm-Thomas K, Markey CN, Sawyer R, Johnson SL. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. Appetite. 2001; 36(3):201–210. [PubMed: 11358344]
20. Johnson SL, Birch LL. PARENTS AND CHILDRENS ADIPOSITY AND EATING STYLE. Pediatrics. 1994; 94(5):653–661. [PubMed: 7936891]
21. Faith MS, Scanlon KS, Birch LL, Francis LA, Sherry B. Parent-child feeding strategies and their relationships to child eating and weight status. Obesity Research. 2004; 12(11):1711–1722. [PubMed: 15601964]
22. Fisher JO, Birch LL. Restricting access to palatable foods affects children's behavioral response, food selection, and intake. American Journal of Clinical Nutrition. 1999; 69(6):1264–1272. [PubMed: 10357749]
23. Hodges EA, Hughes SO, Hopkinson J, Fisher JO. Maternal decisions about the initiation and termination of infant feeding. Appetite. 2008; 50(2–3):333–339. [PubMed: 17977617]
24. Wasser H, Bentley M, Borja J, et al. Infants perceived as "fussy" are more likely to receive complementary foods before 4 months. Pediatrics. 2011; 127(2):229–237. [PubMed: 21220398]
25. Blissett J, Farrow C. Predictors of maternal control of feeding at 1 and 2 years of age. International Journal of Obesity. 2007; 31(10):1520–1526. [PubMed: 17579636]
26. Duke RE, Bryson S, Hammer LD, Agras WS. The relationship between parental factors at infancy and parent-reported control over children's eating at age 7. Appetite. 2004; 43(3):247–252. [PubMed: 15527926]
27. Farrow C, Blissett J. Does maternal control during feeding moderate early infant weight gain? Pediatrics. 2006; 118(2):E293–E298. [PubMed: 16882774]
28. Gillman MW, Ludwig DS. How early should obesity prevention start? The New England journal of medicine. 2013; 369(23):2173–2175. [PubMed: 24224559]
29. Paul IM, Bartok CJ, Downs DS, Stifter CA, Ventura AK, Birch LL. Opportunities for the primary prevention of obesity during infancy. Advances in pediatrics. 2009; 56:107–133. [PubMed: 19968945]
30. Powers SW, Chamberlin LA, van Schaick KB, Sherman SN, Whitaker RC. Maternal feeding strategies, child eating behaviors, and child BMI in low-income African-American preschoolers. Obesity. 2006; 14(11):2026–2033. [PubMed: 17135620]
31. Gross RS, Fierman AH, Mendelsohn AL, et al. Maternal perceptions of infant hunger, satiety, and pressuring feeding styles in an urban Latina WIC population. Academic pediatrics. 2010; 10(1): 29–35. [PubMed: 20004633]
32. Thompson AL, Mendez MA, Borja JB, Adair LS, Zimmer CR, Bentley ME. Development and validation of the Infant Feeding Style Questionnaire. Appetite. 2009; 53(2):210–221. [PubMed: 19576254]
33. Bentley M, Gavin L, Black MM, Teti L. Infant feeding practices of low-income, African-American, adolescent mothers: an ecological, multigenerational perspective. Social Science & Medicine. 1999; 49(8):1085–1100. [PubMed: 10475672]
34. Sacco LM, Bentley ME, Carby-Shields K, Borja JB, Goldman BD. Assessment of infant feeding styles among low-income African-American mothers: Comparing reported and observed behaviors. Appetite. 2007; 49(1):131–140. [PubMed: 17336423]
35. Hoerr SL, Hughes SO, Fisher JO, Nicklas TA, Liu Y, Shewchuk RM. Associations among parental feeding styles and children's food intake in families with limited incomes. The international journal of behavioral nutrition and physical activity. 2009; 6:55. [PubMed: 19678947]
36. Gross RS, Mendelsohn AL, Fierman AH, Hauser NR, Messito MJ. Maternal Infant Feeding Behaviors and Disparities in Early Child Obesity. Childhood Obesity. 2014; 10(2):145–152. [PubMed: 24665873]

37. Thompson AL, Adair LS, Bentley ME. Pressuring and Restrictive Feeding Styles Influence Infant Feeding and Size among a Low-Income African-American Sample. Obesity. 2013; 21(3):562–571. [PubMed: 23592664]
38. Stifter CA, Anzman-Frasca S, Birch LL, Voegtline K. Parent use of food to soothe infant/toddler distress and child weight status. An exploratory study. Appetite. 2011; 57(3):693–699. [PubMed: 21896298]
39. Paul IM, Williams JS, Anzman-Frasca S, et al. The Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) study. Bmc Pediatrics. 2014:14.
40. Sanders LM, Perrin EM, Yin HS, Bronaugh A, Rothman RL. Greenlight Study T. "Greenlight Study": A Controlled Trial of Low-Literacy, Early Childhood Obesity Prevention. Pediatrics. 2014; 133(6):E1724–E1737. [PubMed: 24819570]
41. Taveras EM, Blackburn K, Gillman MW, et al. First Steps for Mommy and Me: A Pilot Intervention to Improve Nutrition and Physical Activity Behaviors of Postpartum Mothers and Their Infants. Maternal and Child Health Journal. 2011; 15(8):1217–1227. [PubMed: 20957514]
42. Jain A, Sherman SN, Chamberlin LA, Whitaker RC. Mothers misunderstand questions on a feeding questionnaire. Appetite. 2004; 42(3):249–254. [PubMed: 15183915]
43. Bronner YL, Gross SM, Caulfield L, et al. Early introduction of solid foods among urban African-American participants in WIC. Journal of the American Dietetic Association. 1999; 99(4):457–461. [PubMed: 10207399]
44. Corbett KS. Explaining infant feeding style of low-income black women. Journal of pediatric nursing. 2000; 15(2):73–81. [PubMed: 10808622]
45. Sanders LM, Perrin EM, Yin HS, Bronaugh A, Rothman RL. "Greenlight study": a controlled trial of low-literacy, early childhood obesity prevention. Pediatrics. 2014; 133(6):e1724–e1737. [PubMed: 24819570]
46. Krassner L. TIPP usage. Pediatrics. 1984; 74(5 Pt 2):976–980. [PubMed: 6493903]
47. Toledo, LPK.; Stubbs, E., et al. Salud Infantil: Understanding and Promoting the Nutritional Health of Latino Infants. Chapel Hill, NC: Carolina Population Center; 2009.
48. Marin, Gea. Development of a Short Acculturation Scale for Hispanics. Hispanic Journal of Behavioral Sciences. 1987; 9(2):183–205.
49. Hu, Lt; Bentler, PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal. 1999; 6(1):1–55.
50. Raftery A. Bayesian Model Selection in Social Research. Sociological Methodology. 1995; 25:11–163.
51. Brown, T. Confirmatory Factor Analysis for Applied Research. 1. The Guilford Press; 2006.
52. Lumeng JC, Taveras EM, Birch L, Yanovski SZ. Prevention of Obesity in Infancy and Early Childhood: A National Institutes of Health Workshop. JAMA pediatrics. 2015
53. DiSantis KI, Hodges EA, Johnson SL, Fisher JO. The role of responsive feeding in overweight during infancy and toddlerhood: a systematic review. International journal of obesity (2005). 2011; 35(4):480–492. [PubMed: 21427696]

Appendix. IFSQ Items and Factor Loadings (Total Sample)

Factor	Item	Factor Loading
Pressuring		
Finishing		
	Behavior Items	
PR1	Try to get (child) to finish his/her food	1
PR2	If (child) seems full, encourage to finish anyway	1.01

Factor	Item	Factor Loading
PR3	Try to get (child) to finish breastmilk or formula	0.66
PR4	Try to get (child) to eat even if not hungry	0.34
PR5	Insist re-try new food refused at same meal	0.77
PR6	Praise after each bite to encourage finish food	0.97
	Belief Items	
PR7	Important for toddler finish all food on his/her plate	0.61
PR8	Important for infant finish all milk in his/her bottle	0.84
Cereal		
	Behavior Items	
PR11	Give/gave (child) cereal in the bottle	1
	Belief Items	
PR12	Cereal in bottle helps infant sleep thru the night	1.44
PR13	Putting cereal in bottle good b/c helps infant feel full	1.14
PR14	An infant <6 mo needs more than formula or breastmilk to be full	1.27
PR15	An infant <6 mo needs more than formula or breastmilk to sleep through the night	0.81
Soothing		
	Behavior Items	
PR16	When (child) cries, immediately feed him/her	1
	Belief Items	
PR17	Best way to make infant stop crying is to feed	1.41
PR18	Best way to make toddler stop crying is to feed	1.27
PR19	When infant cries, usually means s/he needs to be fed	1.09
Restrictive		
Amount		
	Behavior Items	
RS1	I carefully control how much (child) eats	1
RS2	I am very careful not to feed (child) too much	1.05
	Belief Items	
RS3	Important parent has rules re: how much toddler eats	1.33
RS4	Important parent decides how much infant should eat	1.23
Diet Quality		
	Behavior Items	
RS5	I let (child) eat fast food	1
RS6	I let (child) eat junk food	1.11
	Belief Items	
RS7	A toddler should never eat fast food	1.29
RS8	An infant should never eat fast food	1.01
RS9	A toddler should never eat sugary food like cookies	0.63
RS10	A toddler should never eat junk food like chips	0.42

Factor	Item	Factor Loading
RS11	A toddler should only eat healthy food	0.39
Responsive		
Satiety		
	Behavior Items	
RP1	(Child) lets me know when s/he is full	1
RP2	(Child) lets me knows when s/he is hungry	6.36
RP3	I let (child) decide how much to eat	1.86
RP4	I pay attention when (child) seems to be telling me that s/he is full or hungry	7.39
RP5	I allow (child) to eat when s/he is hungry	7.89
	Belief Items	
RP6	Child knows when s/he is full	6.33
RP7	Child knows when hungry, needs to eat	6.65
Attention		
	Behavior Items	
RP8	Talk to (child) to encourage to drink formula/breastmilk	1
RP9	Talk to (child) to encourage him/her to eat	2.13
RP10	Show (child) how to eat by taking a bite or pretending to	1.88
RP11	I will retry new foods if they are rejected at first	1.75
	Belief Items	
RP12	Important to help or encourage a toddler to eat	1.35

* Factor loadings are not standardized

Table 1

Infant Feeding Style Questionnaire (IFSQ) Structure and Content[32]

Feeding Style	Sub-construct	Description
Laissez faire	Diet quality	Parent has no limits regarding food quality or quantity
	Attention	Parent has little or no interaction with child during feeding.
Pressuring	Finish	Parent controls feeding because of concern that child is undereating
	Cereal	Parent uses infant cereal to fill child or soothe
	Soothing	Parent feeds child to soothe
Restrictive	Amount	Parent limits quantities of all foods
	Diet quality	Parents limits child diet to healthy foods
Responsive	Satiety	Parent is attentive to child's cues while setting appropriate limits
	Attention	Parent encourages exploration in a positive environment
Indulgence	Permissive	Parent does not set limits on the quantity or quality of food consumed.
	Coaxing	Parent does not set limits on the quantity or quality of food consumed to ensure child gets enough.
	Soothing	Parent does not set limits on the quantity or quality of food consumed to soothe child.
	Pampering	Parent does not set limits on the quantity or quality of food consumed to make child happy.

Table 2

Characteristics of the Study Population

Characteristic	N	Mean (SD) or %
Parent age at child's 12 month visit (years)	290	29 (5.3)
Relationship to child (% Mother)	287	94%
Country of Origin		
US	49	16%
Mexico	160	53%
Central America	39	13%
South America	33	11%
Caribbean	19	6%
Other	2	1%
SASH		
Language subscale	294	1.8 (1)
Media subscale	286	2.4 (1.3)
Ethnic social subscale	289	2.2 (0.6)
Survey Language (English %)	290	26%
Education	303	
Less than HS	129	43%
HS graduate	84	28%
Some college	52	17%
College graduate	37	12%
Employment	303	
Unemployed	230	76%
Part-time employed	27	9%
Full-time employed	45	15%
Income	303	
<$10K	93	31%
$10–20K	100	33%
$20–40K	67	22%
$40–60K	20	7%
>$60K	15	5%
Unknown	7	2%
BMI	257	28 (6)
% Overweight (BMI >25)	163	63%
% Obese (BMI > 30)	77	30%
Child Age at 12 month visit (weeks)	291	54 (3)
Sex (%female)	303	52%
Birth weight (kg)	299	3.3 (0.5)
Weight (kg, 12 mos)	291	9.8 (1.2)
Height (cm, 12 mos)	287	75 (3)
WLZ (12 mos)	286	0.43 (1)

Characteristic	N	Mean (SD) or %
WLZ >85% (12 mos)	285	26%
BMIz (12 mos)	285	0.43 (1)
BMIz >85% (12 mos)	285	26%

ASH – Short Acculturation Scale for Hispanics; WFL – weight-for-recumbent length z-score, using WHO growth standards

Table 3

IFSQ Score Characteristics and Reliabilities

Factor	Number of items	Mean	SD	1% Percentile	99% Percentile	Cronbach's alpha[1] (Overall, N=303)	(Spanish, n=215)	(English, n=87)
Laissez-faire								
Diet quality	6	1.97	0.72	1	4	0.60	0.61	0.58
Attention	5	1.80	0.64	1	4	0.37	0.28	0.54
Pressuring								
Finish	8	2.50	0.81	1	5	0.73	0.71	0.70
Cereal	5	2.05	0.86	1	4.8	0.65	0.62	0.63
Soothing	4	2.08	1.02	1	5	0.79	0.80	0.61
Restrictive								
Amount	4	3.73	1.00	1	5	0.63	0.63	0.58
Diet quality	7	3.84	0.77	1.7	5	0.69	0.65	0.75
Responsive								
Satiety	7	4.08	0.73	1.1	5	0.67	0.69	0.76
Attention	5	3.82	0.91	1	5	0.65	0.65	0.64

*Response options: 1(disagree), 2(slightly disagree), 3(neutral), 4(slightly agree), 5(agree)

[1]Cronbach's alpha is estimated from initial models including all items for sub-constructs.

Table 4

Goodness of Fit Indices For Feeding Style Constructs, Total Sample (N=303)

Factor	Model Detail	Chi-square	RMSEA (90% CI)	CFI	BIC[1]
Pressuring					
Finish	8 items (Initial)	150.740**	0.147 (0.126–0.170)	0.867	36.53
	7 items (dropped PR5, covariance between PR2–4)	53.668**	0.113 (0.084–0.145)	0.947	−9.15
Cereal	5 items (Initial)	146.903**	0.307 (0.265–0.350)	0.822	118.35
	4 items (dropped PR11)	11.498*	0.125 (0.062–0.200)	0.984	0.08
Soothing	4 items (Initial)	0.742	0.000 (0.000–0.085)	1	−10.68
Restrictive					
Amount	4 items (Initial)	7.774*	0.098 (0.033–0.174)	0.975	−3.65
Diet	7 items (Initial)	282.057**	0.252 (0.227–0.278)	0.817	202.11
	6 items (dropped RS11)	25.733*	0.078 (0.044–0.115)	0.988	−25.66
Responsive					
Satiety	7 items (Initial)	16.401	0.024 (0.000–0.063)	0.998	−63.54
Attention	5 items (Initial)	26.505**	0.119 (0.077–0166)	0.935	−2.05
	4 items (dropped RP12)	8.969*	0.107 (0.043–0.183)	0.972	−2.45

*p<0.05,

**p<0.001;

RMSEA – Root Mean Square Error of Approximation; CFI –Comparative Fit Index

[1]Schwartz's Bayesian Information Criteria (BIC)[50]

Table 5

Goodness of Fit Indices For Feeding Style Constructs, Spanish-Speaking (N=215)

Factor	Model Detail	Chi-square	RMSEA (90% CI)	CFI	BIC[1]
Pressuring					
Finish	8 items (Initial)	93.104*	0.130 (0.104–0.158)	0.876	−14.31
	7 items (dropped PR5, covariance between PR2–4)	33.562*	0.098 (0.061–0.136)	0.955	−25.52
Cereal	5 items (Initial)	90.122*	0.281 (0.232–0.334)	0.809	63.27
	4 items (dropped PR11)	8.736**	0.125 (0.049–0.215)	0.982	−2.01
Soothing	4 items (Initial)	0.085	0.000 (0.000–0.000)	1	−10.66
Restrictive					
Amount	4 items (Initial)	5.868	0.095 (0.000–0.188)	0.976	−4.87
Diet	7 items (Initial)	265.688*	0.289 (0.259–0.320)	0.706	190.5
	6 items (dropped RS11)	19.972**	0.075 (0.030–0.120)	0.985	−28.36
Responsive					
Satiety	7 items (Initial)	29.508**	0.072 (0.035–0.108)	0.988	−45.68
Attention	5 items (Initial)	22.853*	0.129 (0.078–0.185)	0.929	−4
	4 items (dropped RP12)	13.765**	0.165 (0.090–0.253)	0.942	3.024

*p<0.05,

**p<0.001;

RMSEA – Root Mean Square Error of Approximation; CFI –Comparative Fit Index

[1]Schwartz's Bayesian Information Criteria (BIC)[50]