Comparison of Maternal Feeding Practices and Child Weight Status in Children from Three Countries

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Abstract: The present study considered three samples of mothers from Brazil, South Korea, and the United States to determine whether mothers demonstrate a consistent pattern of feeding practices associated with child overweight. Participants included 1204 mothers of children 6-10 years old.

Mothers completed questionnaires to report their children's demographics and their feeding practices with the Parent Mealtime Action Scale (PMAS). The South Korean children showed significantly less obesity (10.4%) than children from Brazil (17.0%) or the United States (19.6%). Confirmatory factor analysis for mothers from all three samples revealed good fit for the same nine PMAS dimensions of feeding practice. Hierarchical multiple regression revealed that after taking into account child age and gender, heavier child weight was found associated with more Fat Reduction and less Insistence on Eating by mothers from all three samples. Results from past experimental research suggest that these two maternal feeding practices would be counter-productive for teaching children's self-regulation of diet and weight management. Alternative maternal feeding practices are suggested.

Keywords: Childhood obesity, parent-child relations, feeding practices, obesity prevention, weight management.

The prevalence of child obesity is rising worldwide [1] and it increases children's risk for a number of health, social, and psychological problems. Health problems associated with child obesity include diabetes, high blood pressure, sleep apnea, and orthopedic abnormalities such as bowed legs and back problems [2]. Social problems include peer teasing, rejection, and being stereotyped as lazy, stupid, ugly, and worthless [3-5]. Psychological problems include poor body image, low self-esteem, and depression [6, 7].

Children in the United States have experienced an obesogenic environment for more than 20 years, with daily media advertisements for ready-to-eat snack foods that are high-fat and high-sugar, as well as energy-dense items available at prevalent neighborhood fast-food restaurants [8, 9]. Additionally, children's consumption of fast-foods has increased by 300% in the past 20 years [10], sweetened soft drinks are now consumed in larger quantities than milk [11], and increasing numbers of children skip breakfast and eat virtually no fruits or vegetables [12, 13].

As American children have increased their energy intake, they have simultaneously decreased their energy expenditure by engaging in more sedentary activities that include watching television, playing videogames, and using a computer [14, 15], with 22% of American children aged 6-17 years now showing a BMI between the 85th and 95th percentile and 11% now showing a BMI that exceeds the 95th percentile [16].

Children from Latin American countries such as Brazil have also experienced an increasingly obesogenic environment with their recent and rapid urbanization, socioeconomic development, and technological innovations, changes which have been associated with reduced physical activity, reduced consumption of fruits and vegetables (FV), and increased consumption of energy-dense snack foods [17, 18]. Additionally, for Brazilian children aged 2-18 years, the prevalence of BMI values above the 85th percentile has increased from 4% to 14% during the past 23 years [19-21].

Similar economic development and technological in novations have also occurred in South Korea, with similar results that children exercise less, eat more fat in their diets, and have higher rates of overweight and obesity [22]. Using the Korean National Health Examination Survey, an upward trend in the prevalence

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of obesity (BMI > 95th percentile) was found between 1998 and 2010, with the prevalence of obesity in Korean children aged 2-18 years increasing from 4% to 8% [23].

It may be widely accepted that children and their parents influence each other during family meals [24], but since Costanzo and Woody suggested that parent feeding practices may influence children's "self-regulation" of diet and weight [25], a number of researchers have attempted to identify specific parent actions most associated with children's diet and weight status [26-28]. Most of these studies have focused on the mother because she is often viewed as the child's primary "nutrition gatekeeper" because of research showing across decades that children's diet quality is associated with the mother's nutritional knowledge, the mother's food purchases, the mother's meal tempo, the mother's work status, and the mother's monitoring of children's food consumption [29-31]. While many early studies of parent feeding practices focused on Caucasian children, more recent studies have examined children from a range of ethnic backgrounds [32, 33]. Some patterns that have emerged from these correlational studies suggest that child overweight is associated with more parent modeling of snack-food consumption and more use of controlling practices such as restriction of high-fat foods, as well as less modeling of FV consumption, and less positive persuasion about the good taste of mealtime foods [34-36].

Wardle and colleagues provide a longitudinal examination of the relationship between child overweight and maternal feeding practices in samples from the United Kingdom [37, 38]. They found that after receiving information that their children are overweight, mothers tend to *increase* fat restriction and *decrease* pressure to eat during meals. Unfortunately, these maternal responses to child overweight may be counterproductive. For example, placing restrictions on specific foods has been found to produce over-consumption of these foods later when children have the opportunity, with overweight children being especially reactive to such food restriction [39, 40]. Therefore, it may be that if mothers respond to their children's overweight with more fat restriction practices, their children may respond with over-consumption of high-fat foods later when they have the opportunity. A recent study involving mother of children aged two to four years supported these findings and showed maternal feeding practices impact children's weight and eating behaviors at a rather young age [41]. The results of questionnaires completed by mothers at baseline and a one year later revealed not only were increases in child weight predicted by maternal controlling behavior, but maternal controlling behavior also predicted child behaviors that could later lead to obesity such as the tendency to overeat. Interestingly, a longitudinal study which followed children from birth to two years of age found the use of two parental mealtime practices during infancy, namely maternal pressure to eat and restriction, negatively predicted children's weight at two years [42]. While this finding is counter to the research showing a relation between controlling feeding practices and increased weight in older children, this finding may explain mother's later use of controlling feeding practices as their use of these strategies was reinforced by the limited weight gained by their infants [42].

Also, if mothers respond to children's overweight with less pressure to eat during mealtimes in an effort to reduce the number of calories consumed, depending on the details of how this practice is used, it may produce problems for children's healthy food selection and weight management. For example, it has been shown that repeated taste exposure is a critical component in the development of taste preferences [43,44], but if mothers stop insistence that children *taste* mealtime foods, children may miss the opportunity repeatedly taste foods and thus fail to develop preferences for healthy new foods. Children who do fail to eat during family mealtimes may also be hungrier between meals and more likely to turn to high-fat snack foods, which can increase their weight gain. Additionally, if children are not encouraged to *try small tastes* of FV during meals, they may miss the beneficial reduction of total mealtime calories that consumption of FV during meals can provide [45, 46]. However, if mothers are too forceful and insist their children consume large amounts of new or disliked foods when they are not hungry, this practice can also be counterproductive and produce lasting food aversions in children [47, 48]. These past studies suggest that mothers need to find a balance between gently nudging their children to taste novel foods enough times for the children to develop preferences for these foods, yet not be perceived as being coercive, which might lead to the production of food aversions.

Besides child overweight, there are other child demographic variables found to be associated with specific maternal feeding practices. For example, mothers usually giving more active guidance in food selection to younger children than to older children [49].

Also, mothers may use more fat restriction practices with female children than male children because they tend to be more concerned about overweight in their daughters than in their sons [50].

PURPOSE OF THE PRESENT STUDY

As there is little research examining maternal feeding practices across cultures, the present study sought to investigate maternal feeding practices most commonly associated with child overweight for three countries with different cultural characteristics and different stages of economic development (Brazil, South Korea, U.S.). Three steps were planned for this investigation: (1) Determine whether the three diverse samples were similar in their prevalence rates for child obesity. (2) Determine whether mothers from the three countries revealed similar dimensions of child feeding practices. (3) Determine whether the three countries revealed consistent patterns of specific maternal feeding practices most associated with children's overweight.

METHODS

Participants

Study participants were mothers of school-aged children between 6 and 10 years of age from Brazil, South Korea, and the U.S. The participants in the U.S. sample were from the original Parent Mealtime Action Scale (PMAS) sample that developed a standardized measure that would describe what actions parents exhibited during meals or used to influence their children's nutrition [36]. In the original study that developed the PMAS, 8622 questionnaires were sent to parents of 1st to 4th grade children from a random sample of schools from each county in Pennsylvania, with 2219 (26%) questionnaires returned that included 2008 from mothers. Brazil and Korea were selected because researchers had independently completed studies in these locations using the same 31-item Parent Mealtime Action Scale [51, 52]. To provide a U.S. sample size approximately equal to those from Brazil and South Korea, 500 mothers from the U.S. sample were randomly selected for the present study with children who included 239 boys, 261 girls (mean age = 8.25 years, SD = 1.30).

For Brazil, a convenience sample was used from seven private schools in the industrialized city of São Paulo. Of the 1642 parents of 6 to 10 year old children asked to participate, 590 (36%) returned questionnaires, including 496 mothers with children who included 223 boys, 273 girls [50] (mean age = 7.92 years, SD = 1.37).

For South Korea, an advertisement for subject recruitment was posted on the six most popular child-rearing internet sites upon approval from the site hosts. Parents had free access to the survey sites, and those who completed the survey were included. Additionally, elementary school teachers in the Seoul metropolitan area willing to participate in this study were recruited *via* workshops, teacher continuing education sessions, and conferences. Teachers distributed surveys to the parents of their students after approval from their school administrators. The response rate for the South Korean sample could not be determined because of no information on the number of parents who saw or heard the various recruitment methods described above, but 288 of the responses received were from mothers of children 6 to 10 years including 138 boys, 150 girls [49] (mean age = 8.00 years, SD = 1.33).

Of the total 1284 mothers from the three countries, 1204 (93.8%) provided complete information for all variables considered in the present study. This final subset of 1204 mothers included 445 children from Brazil (200 boys, 245 girls), 259 children from South Korea (125 boys, 134 girls), and 500 children from the United States (239 boys, 261 girls).

Procedures

Permission to conduct this study was obtained by the Institutional Review Boards of each author's respective university. Assent procedures specified by the IRB were followed. Mothers from all three countries were asked to complete an anonymous questionnaire that asked for the child's age, gender, height, and weight as well as information about the mother's feeding practices. For children from the U.S. and South Korea, BMI% scores were calculated from the weight and height provided by mothers, who were asked to measure them wearing minimal clothing and no shoes. Research has documented the reliability of mothers' reports of their children's height and weight with correlations of .89 or higher between values given by mothers and values independently measured by school nurses [36]. For Brazilian children, height and weight were measured by trained nutritionists with children wearing minimal clothing and no shoes. Children's BMI were converted to World Health Organization (WHO) published BMI% scores relative to children's age groups [53].

Maternal feeding practices for all three cultures were measured with the nine dimensions of the 31-item Parent Mealtime Action Scale (PMAS) [36]: Snack Modeling, Snack Limits, Many Food Choices, Daily Fruit and Vegetable (FV) Availability, Fat Reduction, Positive Persuasion, Insistence on Eating, Use of Rewards, and Special Meals. Mothers used a three-point rating (1 = never, 2 = sometimes, 3 = always) to report how often during a typical week they used each of the 31 actions, then the score for each PMAS dimension was calculated as the mean of three-point ratings for items within that dimension (after reversing appropriate items). For the original sample of 2549 U.S. mothers used to develop the PMAS, the nine dimensions of feeding practices showed a mean internal reliability (Cronbach's alpha) score of .62 (from .42 to .81), with a convenience sample of 49 mothers showing a mean test-retest reliability score of .62 (from .51 to .75), and with a convenience sample of 221 parents showing a mean convergent validity score of .69 (from .59 to .78) between mothers' and fathers' ratings of the mothers' mealtime actions [36].

Data Analysis

The first analysis of the present study examined whether the three diverse samples differed in child obesity prevalence because it could influence mothers' perceptions of whether their children's overweight status was unusual or common, which could influence their probability of taking action to change it. For each sample, the percentage was calculated for children with BMI% scores in the five WHO weight status categories: underweight (under 3%), normal weight (3% to under 85%), overweight (85% to under 97%), obese (97% to under 99.9%), severely obese (99.9% and above). Then, a 3 X 2 Chi^2 analysis compared the three samples (Brazil, South Korea, U.S.) in the percentages of children whose BMI% scores did or did not place them in WHO "obese" categories (97% and above). If the 3 X 2 Chi^2 analysis found significant differences in child obesity prevalence across the three samples, then follow-up 2 X 2 Chi^2 analyses would be used to compare obesity prevalence for each pair of samples (Brazil and U.S., Brazil and South Korea, South Korea and U.S.).

The second analysis of the present study examined whether mothers in the three samples perceived the same nine subscales of the PMAS. Confirmatory factor analysis was conducted for each sample using Amos 19 and SPSS 19 software. Two goodness-of-fit values that were evaluated included relative Chi^2 with values less than 5.00 suggesting acceptable fit, and RMSEA with values less than .10 suggesting acceptable fit [54, 55]. Descriptive statistics (means, SD) and measures of internal reliability (Cronbach's alpha) were calculated for each PMAS subscale. Test-retest reliability was calculated for each PMAS subscale as the Pearson correlation of mothers' ratings calculated from ratings given on two occasions two weeks apart for convenience samples of 55 Brazilian mothers, 45 South Korea mothers, and 49 U.S. mothers. These mothers were subsets from the larger samples included in each country's sample.

The third analysis of the present study identified maternal feeding practices most consistently associated with children's BMI% scores for the three samples. Hierarchical multiple regression analyses were conducted separately for each sample with child demographic variables (age, gender) entered first and simultaneously, then with the nine PMAS subscale scores entered in a stepwise manner. A stepwise approach was chosen to identify maternal feeding practices that best explained variance in child overweight, and to keep as high as possible the ratio of sample size to number of predictor variables.

RESULTS

Child Obesity Prevalence

The 3 X 2 Chi^2 analysis comparing the three samples in their percentages of "obese" children according to WHO standards revealed that the countries were significantly different from each other (Chi^2 = 10.40, *df* = 2, *n* = 1204, *p* = .006), with obesity found for 10.4% of Korean children, 17.0% of Brazilian children, and 19.6% of American children (see Table **1**).

Follow-up 2 X 2 Chi^2 analyses found no significant difference between the Brazil and U.S. samples in the percentage of obese children (Chi^2 = 1.00, *df* = 1, *n* = 945, *p* = .318), but both Brazil and the U.S. had a greater percentage of obese children than South Korea (Chi^2 = 5.80, *df* = 1, *n* = 704, *p* = .016; Chi^2 = 10.44, *df* = 1, *n* = 759, *p* = .001; respectively).

Mothers' Dimensions of Child Feeding Practices

For all three samples of mothers, goodness-of-fit was demonstrated for the nine dimensions of the PMAS [36]: Snack Modeling, Snack Limits, Many Food Choices, Daily FV Availability, Fat Reduction, Positive Persuasion, Insistence on Eating, Use of Rewards, and

Table 1: Percentage of Children in WHO BMI% Weight Status Categories for Samples from Three Countries

	BRAZIL n = 590	SOUTH KOREA n = 288	UNITED STATES n = 500
UNDERWEIGHT (BMI% = less than 3)	4.0%	1.9%	5.4%
NORMAL WEIGHT (BMI% = 3 to less than 85)	62.2%	70.7%	57.2%
OVERWEIGHT (BMI% = 85 to less than 97)	16.6%	17.0%	17.8%
OBESE / SEVERELY OBESE (BMI% = 97 or greater)	17.0%	10.4%	19.6%

Table 2: Factor Analysis Results for Nine PMAS Feeding Dimensions for Mothers from Three Countries

	BRAZIL Mean (SD) Loading	SOUTH KOREA Mean (SD) Loading	UNITED STATES Mean (SD) Loading
SNACK LIMITS	**2.72 (.50)**	**2.23 (.70)**	**2.59 (.52)**
25. You set limits for how many sweets the child could have each day	.76	.86	.87
26. You set limits for how many sodas the child could have each day	.79	.88	.86
27. You set limits for how many salty snacks the child could have each day	.87	.81	.80
POSITIVE PERSUASION	**2.62 (.37)**	**2.04 (.39)**	**2.04 (.42)**
13. You told the child how much you liked the food	.58	.52	.66
14. You told the child how good the food will taste if he/she tries it	.61	.61	.81
15. You told the child that his/her friends or siblings like the food	.70	.79	.75
16. You told the child that a food will make him/her healthy, smart, strong	.62	.74	.61
DAILY FV AVAILABILITY	**2.54 (.49)**	**2.31 (.49)**	**2.46 (.43)**
17. You gave the child fruit each day	.68	.75	.78
19. You ate fruit each day	.80	.87	.82
20. You ate vegetables each day	.71	.73	.68
USE OF REWARDS	**1.35 (.34)**	**1.51 (.36)**	**1.46 (.34)**
1. You made eating the food a game or fun for the child	.50	.45	.50
6. You gave the child a favorite food as a reward for good behavior	.59	.47	.67
7. You offered the child a toy or favorite activity as a reward for eating	.71	.82	.71
8. You offered the child a special dessert as a reward for eating	.73	.79	.62
INSISTENCE ON EATING	**1.80 (.54)**	**1.54 (.45)**	**1.34 (.36)**
28. You insisted the child eat even if he/she said ‘‘I’m not hungry’’	.70	.69	.66
29. You insisted the child eat when he/she was sleepy, not feeling well	.77	.83	.78
30. You insisted the child eat when he/she was emotionally upset	.74	.80	.73

(Table 2). Continued.

	BRAZIL Mean (SD) Loading	SOUTH KOREA Mean (SD) Loading	UNITED STATES Mean (SD) Loading
SNACK MODELING	**1.47 (.42)**	**1.30 (.37)**	**.89 (.42)**
21. You drank soda each day	.69	.72	.61
22. You ate candy or sweets each day	.69	.74	.79
23. You ate salty snacks each day	.73	.67	.74
FAT REDUCTION	**2.28 (.50)**	**1.64 (.44)**	**1.86 (.46)**
12. You stopped the child from eating too much	.24	.02	.60
18. You made changes to the child's food to lower fat	.70	.77	.75
24. You made changes to your own food to lower fat	.54	.75	.69
MANY FOOD CHOICES	**1.97 (.36)**	**1.88 (.33)**	**1.99 (.34)**
4. You let the child eat whatever he/she wanted	.64	.64	.59
5. You let the child flavor the food however he/she wanted	.62	.76	.60
9. You let the child substitute a food for one he/she liked	.68	.44	.60
10. You let the child choose which foods to eat, but only from those offered	.33	.20	.65
(PERMISSIVE) SPECIAL MEALS	**1.37 (.32)**	**1.66 (.28)**	**1.44 (.33)**
2. You ate the same foods as those offered to the child (reversed)	-.67	-.43	-.67
3. You sat with the child, but did not eat	.11	.70	.62
11. You prepared a special meal for the child, different from the family meal	.71	.37	.63
31. You placed some of each food on the child's plate (reversed)	-.58	.17	-.41

Table 3: Internal Reliability and Test-Retest Reliability for Nine PMAS Feeding Dimensions for Samples from Three Countries

	BRAZIL		SOUTH KOREA		UNITED STATES	
	α	*r*	α	*r*	α	*r*
SNACK MODELING	.82	.75	.88	.40	.83	.51
POSITIVE PERSUASION	.56	.62	.68	.85	.72	.56
DAILY FV AVAILABILITY	.67	.80	.74	.59	.73	.51
USE OF REWARDS	.57	.38	.64	.72	.59	.55
INSISTENCE ON EATING	.68	.62	.73	.51	.61	.74
SNACK MODELING	.55	.61	.63	.58	.55	.69
FAT REDUCTION	.54	.70	.49	.70	.54	.75
MANY FOOD CHOICES	.48	.50	.51	.49	.51	.67
SPECIAL MEALS	.42	.68	-.04	.58	.48	.58

Special Meals. More specifically, the goodness-of-fit values for Brazilian mothers were relative Chi^2 = 1.62 (which is below the recommended value of 5.00 to show acceptable fit of the data to the dimensions) and RMSEA = .037 (which is below the recommended value of .10 to show acceptable fit of the data to the dimensions). For South Korean mothers, relative Chi^2 = 1.50 and RMSEA = .044. For U.S. mothers, relative Chi^2 = 1.52 and RMSEA = .032. Table **2** shows items in each PMAS subscale, factor loadings for them, and subscale descriptive statistics (mean, SD) for each of the three samples. Table **3** shows internal reliability

Table 4: Hierarchical Multiple Regression to Compare Maternal Feeding Practices Most Associated with Children's WHO BMI% Scores

	BRAZIL			SOUTH KOREA			UNITED STATES		
PREDICTOR	***beta***	***t***	***p***	***beta***	***t***	***p***	***beta***	***t***	***p***
Entered first and simultaneously:									
CHILD AGE	-.03	.56	.572	-.12	1.99	.048	.12	2.74	.006
CHILD GENDER (0=m, 1=f)	-.09	1.94	.053	-.16	2.75	.006	-.09	2.14	.033
Entered second and stepwise:									
SNACK LIMITS							-.14	3.18	.002
POSITIVE PERSUASION									
DAILY FV AVAILABILITY	-.14	2.90	.004						
USE OF REWARDS	-.12	2.54	.012						
INSISTENCE ON EATING	-.14	3.03	.003	-.23	3.79	.000	-.18	4.20	.000
SNACK MODELING									
FAT REDUCTION	.28	5.97	.000	.27	4.55	.000	.18	3.96	.000
MANY FOOD CHOICES									
SPECIAL MEALS									
	R^2 = .12			R^2 = .13			R^2 = .10		
	$F_{(6, 438)}$ = 10.08			$F_{(4, 254)}$ = 9.82			$F_{(5, 494)}$ = 11.00		
	p = .000			p = .000			p = .000		

and test-retest reliability scores for each PMAS subscale.

Maternal Feeding Practices Associated with Child Age, Gender, and Weight

Hierarchical multiple regression analyses revealed that heavier BMI% scores tended to be found for older children in the South Korean and U.S. samples (p = .048, p = .006, respectively) but not for the Brazilian sample (p = .572). The analyses also revealed that heavier BMI% scores tended to be found for male children than for female children in all three samples (p = .053 for Brazil, p = .006 for South Korea, p = .033 for U.S) (see Table **4**).

Hierarchical multiple regression analyses for all three samples (Brazil, South Korea, U.S.) demonstrated that mothers used more Fat Reduction and less Insistence on Eating during meals when children show heavier BMI% scores (with p = .000 for Brazil, p = .000 for South Korea, p = .000 for U.S. for Fat Reduction; with p = .003 for Brazil, p = .000 for South Korea, p = .000 for U.S. for Insistence on Eating). Results for other maternal feeding practices were less consistent across the three samples. For example, less Daily FV Availability and Use of Rewards was associated with heavier child BMI% scores only for Brazilian mothers (p = .004, p = .012, respectively), and setting fewer Snack Limits was associated with heavier child BMI% only for U.S. mothers (p = .002) (see Table **4**).

DISCUSSION

Results from the present study suggest that children in South Korea experience lower risk for overweight than do children from Brazil and the U.S. One interpretation of these patterns would be that the traditional Korean food contains less fat and more dietary fibers [56] than that found in the environments of Brazilian and U.S. children with its emphasis on vegetables and its typical cooking methods of boiling, steaming, and grilling [57].

Present results also suggest that mothers from three diverse samples in Brazil, South Korea, and the United States have similar perceptions of child feeding practices, as shown by their strong goodness-of-fit values for the nine dimensions of the Parent Mealtime Action Scale [36], and as shown with their similar

internal reliability and test-retest reliability scores. One explanation for why the means of these reliability scores are lower than the traditionally expected .70 value may be that, although mothers may maintain consistent *attitudes* about their approach to feeding their children, the PMAS asked for their recent mealtime *behaviors*, which may be far less consistent, as reflected in the reliability scores [36].

Results from the present study suggest that frequent Fat Reduction and infrequent Insistence on Eating were maternal feeding practices most consistently associated with heavier weight in children for three diverse samples from Brazil, South Korea, and the United States. These two maternal feeding practices are similar to those identified in past longitudinal research as responses that United Kingdom mothers showed when informed that their children were overweight [37, 38]. Past experimental research suggested that these two maternal actions may be counterproductive for improving children's healthy food consumption and reducing children's weight, depending on the details with which they are applied. For example, because experimental and longitudinal research documents that specific food restrictions lead to over-consumption of the foods later when children have the opportunity, maternal efforts of Fat Reduction for their children may result in children eating more high-fat foods when they have the chance, which could increase the children's weight [39, 40].

Also, if mothers respond to their children's overweight with reduced Insistence on Eating *small tastes* of mealtime foods such as FV, past experimental research suggests that these children may not reach the required repeated tastes over time that appear needed to learn to like FV [43, 44]. Without consumption of FV during their meals, children's total mealtime calories would be expected to increase [45, 46], which could also result in weight gain. However, when mothers who go beyond the use of "Insistence on Eating" as simple mealtime expectations that children "try one small bite," and instead use more coercive approaches such as "you must finish that before leaving the table," these actions may be counter-productive and produce lasting food aversions [47, 48]. Clinical research with children who have extreme food selectivity suggests that even initial pea-sized bites of novel foods can increase diet variety [58]. Besides encouraging children to *try small tastes*, other feeding practices are suggested by correlational research to be associated with healthier child diet and weight. For example, mothers could decrease their modeling of snack-food consumption, increase their modeling and daily availability of FV consumption, and increase their positive persuasion of how good the mealtime foods taste [34-36, 59].

One additional consistency across the three diverse samples of the present study was that heavier BMI% scores tended to be found for male children than for female children (p = .053 for Brazil, p = .006 for South Korea, p = .033 for U.S.; see Table **4**). This gender difference may be explained by past research documenting that mothers tend to be more concerned about overweight in their daughters than in their sons [50]. Differences in the three samples for how heavier child BMI% scores were associated with child age are more difficult to explain, but perhaps the longer-standing and more prevalent obesogenic conditions found in the United State in comparison to Brazil and South Korea explain why the older U.S. children become, the more excess weight they are likely to accumulate.

STUDY LIMITATIONS

One limitation of the present study was that measures of the children's BMI% for the South Korean and United States samples were calculated from height and weight values supplied by the children's mothers and thus subject to social desirability effects, with both mothers of underweight and overweight children perhaps most likely to distort their children's scores to make them appear more "normal."

Similarly, the mother's self-report of her child feeding practices could have been distorted by social desirability effects in all three samples, with differences in cultural meanings or translation difficulties adding to the possibility of distortions. For example, mothers from all samples may have been reluctant to admit to how much they displayed Snack Modeling or became permissive and made their children Special Meals different from the shared family meal. South Korean mothers showed a low and negative internal reliability score (-.04) for the PMAS dimension of Special Meals in Table **3**, suggesting that they understood the items differently than the Brazilian and United States mothers, or that they were particularly reluctant to admit to using them. More specifically, item 31 ("You placed some of each food on the child's plate") was found to be positively loaded on the dimension of Special Meals for South Korean mothers (.17), but negatively loaded for Brazilian and United States mothers (-.58, -.41, respectively).

Also, item 12 in the Fat Reduction dimension of Table **2** ("You stopped the child from eating too much") showed very low factor loadings for Brazilian and South Korean mother (.24, .02, respectively) in comparison to that for United States mothers (.60). Perhaps mothers in the extremely obesogenic environment of the United States with very high child obesity rates (19.6%) experienced the most intense social desirability effects to claim that they attempted to "stop" this problem from happening to their children.

Another limitation of the present correlational study is that, even for the highly consistent patterns of maternal feeding practices associated with children's weight across three diverse samples, it is not possible to determine whether maternal feeding practices were the cause or consequence of child feeding behavior or child overweight [24]. To help untangle the direction of these variable relationships, future research could collect longitudinal data on child weight, maternal feeding practices, children's feeding behavior, and child weight at a later date.

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