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Ethnic differences in parental feeding behaviors in UK parents of preschoolers

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Abstract

Childhood obesity is prevalent among ethnic minorities in the UK but little is known about parent feeding practices in these populations. We administered questionnaires assessing parental feeding behaviors and perceptions and concerns relating to child weight to White British (n=271), South Asian (n=59), and Black Afro-Caribbean (n=42) parents of UK 3–5 year-olds. Child BMI z-scores were determined from measured heights and weights. South Asian and Black Afro-Caribbean parents exhibited greater pressure to eat than White British parents. Black Afro-Caribbean parents additionally scored higher on instrumental feeding and lower on monitoring, while South Asian parents scored higher on emotional feeding. Black Afro-Caribbean parents reported the greatest concern about both child overweight and underweight. Ethnic differences were unchanged by controlling for perceptions and concerns relating to child weight, or for actual BMI z, parent education, or household income. Exploratory analyses suggested some evidence for sex differences within ethnic groups. For example, South Asian parents of daughters scored higher than White British parents of daughters on emotional feeding, with no ethnic differences apparent for parents of sons. Our findings support considering variation in parent feeding behaviors and weight-related attitudes by parental ethnicity and child sex when developing obesity interventions.

Keywords

maternal feeding practices; family feeding practices; parental feeding style; child feeding; cultural differences; pediatric obesity/overweight

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INTRODUCTION

Obesity and overweight are prevalent among UK children (Ng Fat, 2015), and children of the two most numerous ethnic minority populations in the UK – Black Afro-Caribbean and South Asian (Jivraj, 2012; Statistics, 2012) – may be disproportionately affected. For example, the 1999 Health Survey for England data revealed that 13% of Afro-Caribbean girls, 9% of Pakistani boys, and 8% of Pakistani girls and Indian boys were obese, compared to 6% of boys and 6% of girls in the larger population (Saxena, Ambler, Cole, & Majeed, 2004). More recently, the National Child Measurement Programme for the 2014–15 school year found 15% of Black or Black British children, and 10% of Asian or Asian British children to be obese, compared to an overall population obesity rate of 9% among children aged 4–5 years (Lifestyles Statistics Team, 2015). Further, when compared to White British children of same weight status, South Asian and Black Afro-Caribbean children have higher insulin resistance, diastolic blood pressure, and HbA1c, putting them at higher risk for commodities of obesity such as cardiovascular diseases and diabetes (Whincup et al., 2011). This makes it increasingly important to understand the origins of child obesity in these populations.

Parent feeding and child eating behavior and weight

Parents engage in various feeding practices to influence their child's eating behaviors (Clark, Goyder, Bissell, Blank, & Peters, 2007; Vollmer & Mobley, 2013). Restriction and pressure to eat as measured using the Child Feeding Questionnaire [CFQ] (Birch et al., 2001) may be thought of as reflecting an authoritarian parental feeding style (high in both demandingness and responsiveness) (Carnell, Benson, Driggin, & Kolbe, 2014; Hughes, Power, Orlet Fisher, Mueller, & Nicklas, 2005). Restriction has been defined as parents' limiting of the child's access to foods, particularly highly processed, energy-dense snack-foods, and is correlated with avid appetite, increased intake, and higher child weight status (Carnell, Kim, & Pryor, 2012; Faith, Scanlon, Birch, Francis, & Sherry, 2004; Jansen et al., 2014; Ventura & Birch, 2008). Pressure to eat, defined as parents' pressing their child to eat healthy foods at meal-times, has been related to lower appetite, lower fruit and vegetable intake, and lower child BMI (Carnell et al., 2014; Ventura & Birch, 2008) (Galloway, Fiorito, Lee, & Birch, 2005) (Carnell et al., 2012; Jansen et al., 2014; Ventura & Birch, 2008). However, findings have been inconsistent, with some studies showing no association between child weight/adiposity and restriction and pressure to eat (Campbell et al., 2010; Carnell & Wardle, 2007), and others suggesting that relationships may depend on the sex of the child (Rhee et al., 2009; Tschann et al., 2015) and the parent (Tschann et al., 2015).

In contrast, monitoring (measured by the CFQ (Birch et al., 2001)) and prompting to eat (measured by the Parental Feeding Style Questionnaire [PFSQ] (Wardle, Sanderson, Guthrie, Rapoport, & Plomin, 2002)) have been conceptualized as reflecting a more authoritative style (low in demandingness and high in responsiveness) (Carnell et al., 2014; Hughes et al., 2005). Monitoring, which may be defined as a milder form of restriction, seems to promote healthier eating behavior in children (Rodgers et al., 2013) and has been correlated with healthier BMI in some studies (Brann & Skinner, 2005; Jansen et al., 2014),

but not others (Carnell & Wardle, 2007; Webber, Hill, Cooke, Carnell, & Wardle, 2010). The prompting to eat scale, which represents a gentler form of promoting intake than pressure to eat (Carnell et al., 2014), has not been used frequently in the literature. However, among African-American and Hispanic parents, a scale measuring authoritative feeding style was associated with greater fruit and vegetable consumption, while authoritarian feeding style was associated with lower fruit and vegetable availability and consumption, suggesting the authoritative feeding style to be more beneficial (Patrick, Nicklas, Hughes, & Morales, 2005).

Non-nutritive feeding practices include emotional feeding, that is, using food to influence the child's emotions, and instrumental feeding, that is, using food to reward certain behaviors. Both practices have been shown to be associated with the obesogenic eating behaviors in children such as increased snacking (Sleddens, Kremers, De Vries, & Thijs, 2010), and emotional and disinhibited eating (Rodgers et al., 2013). One commonly used measure of indulgent feeding style (low in demandingness but high in responsiveness) (Hughes et al., 2005) includes one item measuring instrumental feeding (*I reward my child with something to eat when s/he is well behaved*), and has been associated with increased consumption of low nutrient-dense foods (Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2012) and higher child BMI (Hughes et al., 2005). However, other studies have shown no association between non-nutritive feeding practices and child weight (Carnell et al., 2014; Carnell & Wardle, 2007; Rodenburg, Kremers, Oenema, & van de Mheen, 2014).

Ethnic differences in parent feeding behavior

Parents of ethnic minorities may differ in the degree to which they engage in controlling and non-nutritive feeding behaviors. Studies have suggested that US parents of African-American and Hispanic backgrounds (Cardel et al., 2012; Spruijt-Metz, Li, Cohen, Birch, & Goran, 2006; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002), and Black Afro-Caribbean parents in the UK (Blissett & Bennett, 2013), display more controlling feeding behaviors than their White counterparts. No published studies have reported on feeding behaviors among South Asian parents in the UK. However, one unpublished observational analysis of UK mothers of 1–2 year olds (Wilson, 2011) found that, during mealtimes, South Asian mothers provided less positive eating comments and positive social attention, and gave more negative specific instructions than non-Asian parents of predominantly White British origin, as well as exhibiting less warmth in general parenting based on a self-report measure. The same study found that obese South Asian mothers reported more indulgent parenting and less authoritarian parenting than healthy-weight South Asian mothers. Another study in the US demonstrated that South Asian parents engaged in more non-nutritive feeding behaviors and pressure to eat than White American parents (Momin, Chung, & Olson, 2014). Differences in levels of controlling and non-nutritive feeding practices and in the home food environment have also been observed between different minority groups. For example, Hispanic parents in the US reported higher control and more child-responsive feeding strategies than African-American parents (Hughes et al., 2006). Importantly, relationships between parenting styles and feeding and child eating behavior and weight may depend on the cultural context, with feeding practices or styles having different effects on children of differing ethnic groups. For example, in contrast to findings

in predominantly white populations, one study of African-American parents reported a *positive* correlation between pressure to eat and adiposity (Spruijt-Metz et al., 2006).

Potential explanations for ethnic differences in parent feeding behavior

Cultural differences in weight and food-related attitudes may drive ethnic differences in parent feeding behaviors that could in turn make the children of ethnic minorities more obesity prone. For example, evidence suggests that low-income African-American parents may have a higher threshold for perceived child overweight than low-income White and Hispanic-American parents (Sherry et al., 2004), with other evidence suggesting that parents may be more likely to engage in controlling feeding behaviors when they are more concerned about their child's weight (Gray, Janicke, Wistedt, & Dumont-Driscoll, 2010) and when their child is actually higher in weight (Polfuss & Frenn, 2012). Parents of ethnic minorities may hold different cultural attitudes towards food, such as associating greater food consumption and availability with higher social status (Kumanyika, 2008). A study of Asian-Indian mothers in the US found that feeding behaviors such as pressure to eat and use of food as a reward were driven by explicit efforts to encourage the consumption of Indian dishes and pass on cultural values of respecting and not wasting food (Momin et al., 2014). Qualitative evidence suggests that Afro-Caribbean parents perceive themselves as making efforts to both hold onto their family traditions and live healthily in a community context that they see as stressful and fast paced (Bramble, Cornelius, & Simpson, 2009) – a combination of factors that could lead to less responsive parenting practices. Minority families are more likely to have lower incomes, making them vulnerable to consuming cheaper, more energy-dense foods (Kumanyika, 2008), and previous research has shown raised obesity rates among UK Bangladeshi children to be driven by low SES, with a multitude of sociodemographic/cultural factors and family practices (e.g. parental education, English proficiency, regular bedtimes) contributing to raised obesity within the Black Afro-Caribbean population (Zilanawala et al., 2015). Minority parents may also experience more stress and depression, which have been associated with poorer feeding behaviors (Hurley, Black, Merry, & Caulfield, 2015).

There is also evidence for ethnic differences in general parenting practices, which could translate into differences in feeding behavior. For example, qualitative research in US African-American families has suggested that they may put a greater value on discipline, possibly in anticipation of the race- and SES- related difficulties they expect their children to face (Julian, McKenry, & McKelvey, 1994). A study of British Pakistani mothers of 7–11 years olds found that this group reported “following through on discipline” more than White British parents (Ali & Frederickson, 2011). Ethnic differences in feeding may also depend somewhat on child sex. Research has suggested that in South Asian culture, mothers achieve a higher social status by giving birth to sons (Bhopal, 1998), and British Pakistani mothers have reported following through on discipline with sons more than White British parents (Ali & Frederickson, 2011); this cultural difference in parenting towards boys could potentially translate into differences in parent feeding behavior.

As the UK population becomes more diversified (Jivraj, 2012), it becomes increasingly important to explore ethnic differences in parental feeding behaviors and how they might

contribute to disparities in pediatric obesity. Our goal for this study was therefore to investigate how feeding practices differ by ethnic group within a sample of UK preschoolers including three different ethnic backgrounds: White British, South Asian and Black Afro-Caribbean. Based on previous findings, we hypothesized that 1) South Asian and Black Afro-Caribbean parents would score higher than White British parents on authoritarian and controlling feeding behaviors (restriction, pressure to eat, instrumental feeding); and 2) South Asian and Black Afro-Caribbean parents would score lower than White British parents on authoritative feeding behaviors (monitoring, prompting to eat). As exploratory aims, we also tested whether ethnic group differences remained when controlling for perceptions and concerns relating to child weight, child BMI z score, parent education and parent income, and if there were sex differences in feeding behaviors and ethnic group effects.

SUBJECTS/METHODS

Recruitment

Students and parents from twelve socioeconomically diverse London public primary schools were recruited. The schools were chosen to represent a diverse socioeconomic range based on student eligibility for Free School Meals, a government-benefit for low-income families. Letters were sent to the parents with study information and the option to exclude their child prior to data collection. On the day of data collection, researchers distributed questionnaires to parents as they delivered their children to school and researchers weighed and measured all children present in nursery and reception classes. Parents who missed distribution were either approached when collecting their child from school, or received questionnaires at home via their child's class teacher. Reminders with freepost envelopes sent to those who did not respond within two weeks, and parents with questionnaires still outstanding two weeks after this initial reminder were sent a second questionnaire and freepost envelope. Ethical approval for this study was obtained from the Joint University College London/ University College London Hospital Ethics Committee.

Measures

Demographic and anthropometric information—Demographic information including parent ethnicity, marital status, education level, employment status, car and home ownership, and annual family income was self-reported by parents. Following categorizations used in previous studies of similar ethnic groups (Blissett & Bennett, 2013; Pomerleau, McKeigue, & Chaturvedi, 1999), parents of Indian, Pakistani, and Bangladeshi origin were grouped into a single South Asian category, while Black African and Black Caribbean parents were combined into a Black Afro-Caribbean group. Trained researchers weighed children to the nearest tenth of a kilogram in light clothing, without shoes, using TANITA digital scales (Tanita Corp., Tokyo, Japan). Children were measured to the nearest millimeter with a level head, legs straight, shoulders relaxed, and arms placed at the side, using a Leicester height measure (Seca, Birmingham, UK). BMI z-scores were based on 1990 UK growth reference curves and weight categories were determined using International Obesity Task Force cut-offs, which are based on BMI centile curves passing

through 25 and 30 kg/sq at age 18 generated from six large nationally representative datasets (Cole, Bellizzi, Flegal, & Dietz, 2000; Cole & Lobstein, 2012).

Parental Feeding Behavior—Two parental feeding questionnaires were administered. The Child Feeding Questionnaire [CFQ] (Birch et al., 2001), is a commonly used self-report measure developed to assess parental beliefs, attitudes and practices regarding child feeding. This was used to measure Restriction (8 items, e.g. ‘I have to be sure that my child does not eat too many high-fat foods’), Monitoring (3 items, e.g. ‘How much do you keep track to the high-fat foods your child eats?’), and Pressure to Eat (4 items, e.g. ‘My child should always eat all of the food on her plate’), as well as Perceived Child Weight (3 items, e.g. ‘How would you describe your child’s weight as a preschooler?’), and Concern about Child Overweight (5 items, e.g. ‘How concerned are you about your child becoming overweight?’). A Concern about Child Underweight (5 items) subscale was adapted from the Concern about Child Overweight subscale by changing the phrases ‘eating too much’ to ‘not eating enough’, ‘having to diet to maintain desirable weight’ to ‘having to eat high energy foods to maintain a reasonable weight’, and ‘overweight’ to ‘underweight’. Parental Prompting to Eat (8 items, e.g. ‘I present food in an attractive way to your child’), Emotional Feeding (5 items, e.g. ‘I give my child something to eat to make him/her feel better when he/she is feeling upset’) and Instrumental Feeding (4 items, e.g. ‘In order to get my child to behave him/herself I promise him/her something to eat’) sub-scales were taken from the 27-item Parental Feeding Style Questionnaire [PFSQ (Wardle et al., 2002)].

Statistical analysis

To investigate ethnic differences (White British vs. Black Afro-Caribbean vs. South Asian) in sample characteristics we ran chi-square tests for categorical variables and univariate ANOVAs for continuous variables, using specific chi-squared tests and Tukey’s Range Tests for post-hoc exploration of differences. To examine ethnic differences in parental feeding practices, we ran univariate ANOVAs for each parent feeding variable with Tukey’s Range Test for post-hoc differences. To investigate whether ethnic differences in parent feeding remained when controlling for perceptions and concerns relating to child weight, we ran ANCOVAs for ethnic differences in each parent feeding behavior, including each perception and concern variable separately. To explore the possibility that ethnic effects differed by child sex, we repeated these analyses for boys and girls separately, using Tukey’s Range Test to explore differences. Then, where these analyses supported sex differences, we ran a univariate ANOVA explicitly testing the sex by ethnic group interaction. To exclude the influence of other potential confounders we also repeated all of the above analyses controlling for a) child BMI z-score, b) parent education and c) household income. SPSS 24.0 was used for all statistical analyses.

RESULTS

Of an approximate total of 1140 students in the twelve schools, 439 had completed questionnaires and anthropometric data available. Based on reported data on parent ethnicity, 271 parents were designated White British, 59 South Asian (Indian/Pakistani/Bangladeshi), 39 Black Afro-Caribbean (Black African/Black Caribbean), 13 White European, 6 Chinese,

40 Other (Mixed, Middle Eastern and Southeast Asian), and 8 Missing. Data from the three most represented ethnic groups were included in the analysis sample, which was composed of 271 (72.8%) White British, 59 (15.9%) South Asian, and 42 (11.3%) Black Afro-Caribbean families. Table 1 shows descriptive statistics for each of these ethnic groups. There were 413 (94.5%) mothers, 21 (4.8%) fathers, and 2 (0.7%) other guardians. The proportion of overweight and obese children differed between ethnic groups ($p=0.025$) and a univariate ANOVA revealed ethnic differences in child BMI z-score ($p=0.004$), such that South Asian children had higher BMI z-score values when compared to Black Afro-Caribbean children (Tukey $p=0.003$). Chi-square tests revealed differences in marital status ($p=0.001$), such that 94.9% of South Asian, 80.8% of White British, and 64.3% of Black Afro-Caribbean parents had a partner. Differences were also found in car and home ownership (both $p<0.001$), such that fewer Black Afro-Caribbean parents owned one or more cars, or a house, when compared to White British and South Asian parents. Ethnic differences were apparent for annual family income ($p<0.001$), such that Black Afro-Caribbean parents reported lower incomes than White British parents (post-hoc chi-squared $p<0.001$). Ethnic differences were also apparent for Concern about Child Overweight ($p<0.001$) such that Black Afro-Caribbean parents showed higher concern when compared to the other ethnic groups (Tukey $p<0.001$ for both), and for Concern about Child Underweight ($p<0.001$) such that Black Afro-Caribbean parents reported higher concern when compared to both White British and South Asian parents (Tukey $p<0.001$ and $p=0.046$, respectively).

Figure 1 shows mean scores and standard errors for the six selected parental feeding practices. Univariate ANOVA revealed ethnic differences in monitoring ($p=0.001$), such that Black Afro-Caribbean parents reported lower use of this practice compared to White British parents (Tukey $p=0.001$). These were also ethnic differences for pressure to eat ($p<0.001$), such that Black Afro-Caribbean and South Asian parents reported higher pressure to eat when compared to the White British group (Tukey $p<0.001$ and $p=0.004$, respectively). For non-nutritive feeding practices, ethnic differences were evident for emotional feeding ($p=0.011$) and instrumental feeding ($p=0.008$), such that South Asian parents reported greater use of emotional feeding than White British parents (Tukey $p=0.048$) and Black Afro-Caribbean parents reported greater use of instrumental feeding than White British parents (Tukey $p=0.038$). Ethnic groups had similar scores on restriction and prompting to eat. These results remained significant when controlling in separate analyses for perceived child weight, concern about child overweight, concern about child underweight, child BMI z score, parent education and income, with the exception of emotional feeding, which became non-significant when controlling for concern about child overweight ($p=0.059$), concern about child underweight ($p=0.109$), and income ($p=0.072$).

Mean scores and standard errors for the four parental feeding practices showing differential ethnic effects for each sex are illustrated in Figure 2. For boys, but not girls, ethnic differences in monitoring were apparent ($p=0.002$), such that Black Afro-Caribbean parents reported lower use of this practice when compared to White British and South Asian parents (Tukey $p=0.001$ and $p=0.048$, respectively). A slightly different pattern of significant differences for each sex (boys: $p=0.002$, girls: $p<0.001$) was also observed for pressure to eat, such that both Black Afro-Caribbean and South Asian parents of boys scored higher

than White British parents (Tukey $p=0.011$ and $p=0.043$, respectively), but only Black Afro-Caribbean parents of girls scored higher than those of White British parents of girls (Tukey $p=0.001$). For emotional feeding, the pattern of ethnic differences also differed for boys and girls, such that South Asian parents of girls reported greater use of emotional feeding when compared to White British parents of girls (main effect $p<0.001$; Tukey $p<0.001$), but this was not observed in boys; this was reflected in a significant sex by ethnic group interaction for emotional feeding (main effect $p=0.001$). For instrumental feeding, ethnic differences were only apparent in girls ($p=0.005$), such that South Asian parents reported greater use of instrumental feeding when compared to White British parents (Tukey $p=0.010$). All results remained significant when controlling for perceived child weight, concern about child overweight, concern about child underweight, child BMI z score, parent education and income.

DISCUSSION

The purpose of our study was to investigate whether parental feeding behaviors differed by ethnicity and, if so, to explore differences by child sex, and possible mediators of observed ethnic differences. To our knowledge, this study is the first to compare the parental feeding behaviors between multiple ethnic groups in the UK including both Afro-Caribbean and South Asian families. As expected, we observed significant differences in feeding practices between the three ethnic groups. Specifically, South Asian and Black Afro-Caribbean parents scored higher than White families on pressure to eat, emotional feeding and instrumental feeding, and Black Afro-Caribbean parents scored lower than White families on monitoring. The emergence of ethnic differences in our study is consistent with previous studies revealing ethnic differences in parent feeding conducted in both the US (Cardel et al., 2012; Hughes et al., 2006; Spruijt-Metz et al., 2006; Spruijt-Metz et al., 2002) and the UK (Blissett & Bennett, 2013).

Contrary to our predictions, the higher levels of authoritarian and non-nutritive feeding behaviors exhibited by minority parents could not be explained by parental concern about child weight (Gray et al., 2010; Webber et al., 2010). This was true despite the interesting incidental finding that ethnic minority parents were more concerned than White parents about both child over- and underweight – a finding that was driven primarily by the Afro-Caribbean group, and persisted even when controlling for perceived and actual child weight. Observed ethnic differences were also independent of parental education, household income, and actual child BMI z-score. Together these findings suggest that other cultural factors could be more important determinants of feeding behavior in ethnic minority groups than demographic and anthropometric factors and attitudes towards weight. In support of this, a previous study in the US found that concern about child overweight led to increased restriction and slower increase in total fat mass in White American children, but initial concern was not correlated with feeding practices in African-American parents and had no longitudinal effect on child fat mass (Spruijt-Metz et al., 2006).

The ethnic differences in feeding that we observed could have resulted from a multitude of social and cultural pressures. Black Afro-Caribbean and South Asian parents may use food to preserve their cultural identities as immigrants (Bramble et al., 2009; Momin et al., 2014),

potentially leading them to pressure their children to eat foods associated with their culture. Minority parents are also more likely to follow through on discipline in terms of general parenting (Ali & Frederickson, 2011; Hughes et al., 2005; Julian et al., 1994) and display less warmth (Wilson, 2011) – features of an authoritarian general parenting style, which has been correlated with high levels of restrictive feeding, pressure to eat, and monitoring (Hubbs-Tait, Kennedy, Page, Topham, & Harrist, 2008). This is consistent with the previous UK study of South Asian mothers of infants which reported less positive instructions and social attention and more negative instructions during mealtimes (Wilson, 2011). Moreover, parents of ethnic minorities are shown to become more authoritative in their parenting style with increases in acculturation (Farver, Xu, Bhadha, Narang, & Lieber, 2007; Querido, Warner, & Eyberg, 2002) – a variable not measured in this study. Notably, Latino parents who scored higher on acculturation, i.e. reported higher assimilation to the dominant Anglo culture, have been shown to engage in less controlling general parenting practices which in turn were associated with unhealthy eating habits (Arredondo et al., 2006), highlighting the strong influence of culture. All this evidence suggests that cultural factors may impact parent feeding behaviors within the UK population.

Interestingly, our results also showed that some of the trends we observed differed by child sex, with a significant child sex by ethnic group interaction emerging for emotional feeding, such that South Asian parents reported higher scores than White British parents for girls only. This is consistent with previous research suggesting South Asian parents report different parenting attitudes and behaviors with sons (Ali & Frederickson, 2011; Bhopal, 1998), and suggests a further dimension of variation within cultural disparities relating to parental feeding, such that ethnic minorities may adopt different parental feeding attitudes depending on the sex of their child. Since Afro-Caribbean and South Asian boys and girls in the UK are disproportionately affected by obesity (Saxena et al., 2004), ethnic differences and child sex could both be important to consider when developing interventions.

Child BMI may not be the ideal way to measure ethnic differences in body fatness, since previous research suggests that children from different ethnic groups have disproportionate fat mass at similar BMIs due to differences in height and body composition which may contribute to minority children's increased risk of insulin resistance and cardiovascular diseases (Whincup et al., 2011). As in much parent feeding research, practices were self-reported rather than directly observed, and we therefore cannot exclude the possibility that parents of different ethnic origins could have different interpretations of questionnaire items given different cultural ideals for parenting (Bramble et al., 2009; Hughes et al., 2006). Larger studies should test whether the relationship between feeding practices and child BMI z score differ between ethnic groups (Spruijt-Metz et al., 2006), and whether these relationships are further impacted by child sex (Hughes et al., 2006) – analyses for which this study was underpowered. Fathers are under-represented in much feeding research (Khandpur, Blaine, Fisher, & Davison, 2014) and previous studies have highlighted differences in feeding between mothers and fathers (Tschann et al., 2015). The small number of fathers in our sample prevented us from exploring potential interactions between parent sex, child sex and ethnic group. Nevertheless, our results provide compelling evidence that parental feeding differs by ethnicity, and suggest that cultural variation should therefore be considered in efforts develop effective child obesity interventions.

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Figure 1.
Mean (+ SE) parent feeding practice scores by ethnic group.
Abbreviation: *p<0.05, **p=0.001; ***p<0.001.

Figure 2. Mean (+ SE) parent feeding practice scores by ethnic group for each sex (practices showing differential ethnic effects for each sex only). * $p < 0.05$, ** $p = 0.001$; *** $p < 0.001$; a: interaction between child sex and ethnic group.

Table 1

Parent demographics, child demographics and anthropometrics, and perceptions and concerns regarding child weight by ethnic group.

Variables	Categories	Ethnicity			p-value
		White British n=271 (72.8%)	South Asian n=59 (15.9%)	Black Afro- Caribbean n=42 (11.3%)	
Parent					
Age *		35.14 (5.5)	34.38 (5.6)	35.29 (5.6)	0.604
Sex **	Female	259 (95.6)	54 (91.5)	38 (90.5)	0.243
	Male	12 (4.4)	5 (8.5)	4 (9.5)	
Relationship with the child **	Mother	259 (95.9)	56 (94.9)	38 (92.9)	0.517
	Father	8 (3.0)	3 (5.1)	3 (7.3)	
	Guardian	3 (1.1)	0 (0.0)	0 (0.0)	
Marital status **	With partner	219 (80.8) ^a	56 (94.9) ^b	27 (64.3) ^c	0.001
	Without partner	52 (19.2)	3 (5.1)	15 (35.7)	
Education **	University degree or higher	25 (9.2)	8 (13.6)	4 (9.5)	0.599
	School degree or lower	246 (90.8)	51 (86.4)	38 (90.5)	
Employment **	Employed	125 (46.5)	26 (44.1)	17 (41.5)	0.811
	Unemployed	144 (53.5)	33 (55.9)	24 (58.5)	
Car ownership **	No	30 (11.5)	6 (10.5)	16 (39.0)	<0.001
	Yes, one car or more	232 (88.5) ^a	51 (89.5) ^a	25 (61.0) ^b	
Home ownership **	Rent and other	69 (25.9)	20 (34.5)	30 (73.2)	<0.001
	Own/buying	197 (74.1) ^a	38 (65.5) ^a	11 (26.8) ^b	
Annual household income **	£19,999 ^f	49 (23.80) ^a	10 (25.60)	21 (63.60) ^b	<0.001
	>£19,999 ^f	157 (76.20)	29 (74.40)	12 (36.40)	
Child					

Variables	Categories	Ethnicity			p-value
		White British n=271 (72.8%)	South Asian n=59 (15.9%)	Black Afro- Caribbean n=42 (11.3%)	
Age [*] n=370/372 (99.46%)		4.37 (0.6)	4.44 (0.5)	4.41 (0.5)	0.696
Sex ^{**} n=370/372 (99.46%)	Female	125 (46.7)	25 (43.1)	20 (47.6)	0.869
	Male	144 (53.3)	33 (56.9)	22 (52.4)	
Weight status ^{**} n=372/372 (100%)	Underweight/ Normal weight	185 (68.30)	46 (78.00) ^a	22 (52.40) ^b	0.025
	Overweight/ Obese	86 (31.70)	13 (22.00)	20 (47.60)	
BMI (z-score) [*] n=372/372 (100%)		0.62 (1.0)	1.32 (1.0) ^a	1.03 (1.2) ^b	0.004
<i>Perception and concerns regarding child weight</i>					
Perceived child weight ^{**} n=367/372 (98.66%)		2.96 (0.26)	2.93 (0.39)	2.95 (0.23)	0.857
Concern about child overweight ^{**} n=367/372 (98.66%)		1.68 (0.90) ^a	1.79 (1.23) ^a	2.59 (1.34) ^b	<0.001
Concern about child underweight ^{**} n=366/372 (98.39%)		1.91 (1.12) ^a	2.22 (1.33) ^a	2.80 (1.36) ^b	<0.001

* ANOVA - M: mean; SD: standard deviation.

** Chi-squared - n (%). BMI: body mass index.

^f Department for Work and Pensions. Households below average income: an analysis of the income distribution 1994/95 – 2008/09.

^{a-c} Different letters indicate significant differences based on post-hoc testing (Tukey for ANOVAs, separated chi-squared analyses for chi-squared test), p<0.05.