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Food Selectivity, Mealtime Behavior Problems, Spousal Stress, and Family Food Choices in Children with and without Autism Spectrum Disorder

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Abstract

Mealtime behavior problems and family stress occur frequently among families of children with autism spectrum disorder (ASD). However, it is unknown whether food selectivity is an associated factor. The associations of high food selectivity with mealtime behavior problems, spousal stress, and influence on family members were assessed among 53 children with ASD and 58 typically developing (TD) children ages 3–11 years. Compared to TD children, children with ASD were more likely to have high food selectivity, and their parents reported more mealtime behavior problems, higher spousal stress, and influence on what other family members ate. High food selectivity was associated with mealtime behavior problems in both groups. Interventions to reduce food selectivity may lead to decreases in mealtime behavior problems.

Keywords

Autism Spectrum Disorder; Food Selectivity; Mealtime Behaviors

Children with autism spectrum disorder (ASD) are more likely to experience feeding problems compared to typically developing (TD) children, (Sharp et al. 2013) and food selectivity is often reported as a common cause of their feeding problems (Ledford & Gast, 2006). Over the last 10–15 years this issue has received increased attention in the scientific

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literature. For example, Ahearn et al. conducted a lab-based study wherein 30 children with ASD ages 3–14 years were exposed to twelve different food items over the course of six sessions (Ahearn, Castine, Nault, & Green, 2001). Only four children of the 30 children in the study accepted over 60 bites of food (classified as high food acceptance). Over half of the children (n=17) took fewer than 30 bites (classified as low food acceptance). Several small-to-moderate sized observational studies have also documented elevated rates of food selectivity in children with ASD compared to their typically developing (TD) peers, and have used different methodologies to assess this phenomenon (Bandini et al., 2010; Schreck, Williams, & Smith, 2004; Zimmer et al., 2012). In a longitudinal birth cohort study in England, the Avon Longitudinal Study of Parents and Children (ALSPAC) study, information on eating and child dietary patterns was obtained in infancy and early childhood before the diagnosis of ASD was made (Emond, Emmett, Steer, & Golding, 2010). Although no dietary differences were observed in infants at 6 months, toddlers and pre-school aged children who were later diagnosed with ASD were found to consume fewer vegetables, less fresh fruit, and had less varied diets than children without ASD. A significant strength of the ASLPAC study was that food selectivity was observed in children prior to the time that a diagnosis of ASD was rendered.

Several studies have also compared nutrient intakes between children with ASD and those without ASD, but only a few have examined the association between food selectivity and nutrient intakes (Bandini et al., 2010; Lockner, Crowe, & Skipper, 2008; Zimmer et al., 2012). Both Bandini *et al.* (2010) and Zimmer *et al.* (2012) found that food selectivity was associated with greater risk for nutrient inadequacy. In contrast, data presented by Lockner and colleagues (2008) suggested that while children with ASD were more likely to be picky eaters than those without ASD, they had similar nutrient intakes. However, there was no examination of nutrient intake relative to food selectivity.

Despite the emerging literature concerning food selectivity in children with ASD and its impact on nutrient adequacy, less is known about its impact on family mealtimes. Mealtimes are recognized as offering important benefits to families, such as providing structure and promoting a sense of belonging and greater family cohesion. A handful of studies have shown that disruptive mealtime behaviors are more common in children with ASD (Johnson et al., 2014; Nadon, Feldman, Dunn, & Gisel, 2011) and are a source of parental concern (Rogers, Magill-Evans, & Rempel, 2012). In a small study that consisted of interviews with 14 mothers of children with ASD, mothers reported that their children's food selectivity limited other family members' food choices, and mealtimes were described as lacking in meaningful positive interactions and rituals (Marquenie et al. 2011). Ausderau & Juarez (2013) interviewed six mothers of children with ASD who reported that mealtimes were a source of stress rather than enjoyment for their families (Ausderau and Juarez 2013). Another small qualitative study of 11 parents of children with ASD documented children's "need for sameness" (e.g., food prepared and presented in a specific way), refusing to come to the table, difficulty sitting at the table, and throwing food (Rogers et al. 2012).

Despite the research on behavioral problems observed at mealtimes in children with ASD, limited empirical evidence exists on the relationship between behavior problems and food selectivity. Furthermore, to our knowledge no quantitative approaches to assessing the

impact of food selectivity on children's mealtime behavior, parental stress, or the influence on other family members' food choices have been employed. We hypothesized that mealtime behavior problems and parental stress at mealtimes would be higher in families of children with ASD and that high food selectivity would be associated with these outcomes. Accordingly, in this study we: 1) assessed whether parental report of children's mealtime behavior problems, spousal stress at mealtimes, and the impact on family members' food choices was greater among families of children with ASD compared to TD children; and 2) determined whether food selectivity was related to parental report of mealtime behavior problems and spousal stress, and whether this relationship differed between children with ASD and TD children.

METHODS

The present analysis is based on a larger study that was designed to assess dietary patterns, mealtimes, and physical activity patterns of children with ASD and TD children and has been previously described (Bandini et al. 2010). Briefly, 53 children with ASD and 58 TD children ages 3–11 years were recruited via outreach to local community programs, on-line postings, existing participant databases, and numerous autism support organizations, including the Interactive Autism Network (IAN) Project at the Kennedy Krieger Institute, Baltimore, MD. Participants were excluded if they had been diagnosed with a disease or disorder known to affect dietary and/or physical activity habits or if they were taking medications known to have an impact on appetite (e.g., atypical antipsychotics). ASD diagnoses were verified via the Autism Diagnostic Interview-Revised (ADI-R) (Rutter et al. 2003). Parents provided written informed consent. The study was approved by the [removed for review] Institutional Board.

Parents completed a number of self-report questionnaires including a modified version of the Youth/Adolescent Food Frequency Questionnaire (YAQ). The YAQ was originally developed as a self-administered food frequency questionnaire (FFQ) for the Growing up Today Study (Field et al. 1999) and is based on the original Harvard Food Frequency Questionnaire (Willet 1998). FFQs have been shown to be a valid indicator of usual food intake during a year (Rockett et al. 1997). Food refusal was assessed using the FFQ and was operationalized as the absolute number of foods the parent indicated that the child would not eat, as well as the percentage of foods the child would not eat relative to the number of foods offered. In our previous work, we defined food selectivity as consisting of three distinct domains: food refusal, limited food repertoire, and high frequency of single food intake, though we did not observe high frequency single food intake in either children with or without ASD (Bandini et al. 2010). It should be noted that in this context "food refusal" relates to the number of foods a child declines to eat, and should not be confused with the term that is used in the behavioral treatment literature which refers to children who are not eating sufficient food to meet their energy needs for growth and development. These domains (refusal and limited repertoire) can be used together or separately to characterize an individual's food selectivity. For the present analysis we elected to use our measure of food refusal (measured using a modified FFQ) as our measure of food selectivity, and we further defined a cut-point for high food refusal that was defined as the highest quartile among the TD children in the study.

Parents completed *Meals in Our Household*, a parent-report questionnaire that we developed to characterize family mealtime environments and mealtime behaviors of children with ASD and TD children (Anderson et al. 2012). The questionnaire has been evaluated for reliability and validity in distinct populations and assesses six domains relative to family mealtimes and child mealtime behaviors (Anderson et al. 2012). For the present analysis, we focused on three areas: 1) *Child Mealtime Behavior Problems*, the frequency and extent of problematic behaviors the child may exhibit at mealtimes; 2) *Spousal Stress Related to Child's Mealtime Behavior*, the extent to which the parent believes that the child's behavior at mealtimes negatively impacts their spouse or partner and/or is a source of stress in their relationship with him or her; and 3) *Influence of Child's Food Preferences*, the extent to which the child's food preferences impact what other members of the family eat.

We used the *Child Mealtime Behavior Problems* scale (10 items) of the Problematic Mealtime Behaviors domain; items were phrased as statements (e.g., [Child's Name] refuses to come when it is time to eat), and parents were instructed to choose how often the statement described their child's eating behavior during the past 3 months, with five response options coded as: never (0), rarely (1), sometimes (2), often (3), very often (4). For the *Spousal Stress Related to Child's Mealtime Behavior* domain (4 items), parents were asked how strongly they agreed or disagreed with statements (e.g., My child's behavior at meals bothers my spouse/partner) with response options of strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), and strongly agree (5). For the *Influence of Child's Food Preferences* domain (3 items), two items asked parents how strongly they agreed (five-level response coded as above) that the child's food preferences influenced what a) their spouse/partner and b) other children ate. The third item in this domain assessed the frequency with which the child's food preferences influenced the respondent's own food choices, with response options of: never (0), rarely (1), sometimes (2), often (3), always or almost always (4). Note that these questions only applied to parents who reported having a spouse. Responses were summed within each scale or domain and we report the mean and standard deviation. We also present the percentage of parents of children with ASD and parents of TD children who endorsed each item. We operationalized this as parent report of "often" or "very often", "agree" or "strongly agree" or "always or almost always".

Statistical Analysis

Characteristics of children with ASD and TD children were compared using independent sample t-tests for continuous variables and chi-square tests for categorical variables. We present means and standard deviations for the mealtime behaviors, spousal stress, and influence scales. We present proportions for high refusal of food and for each item of the aforementioned scales. The associations between high food selectivity and mealtime behavior problems, spousal stress, and influence on family members were assessed by linear regression models adjusted for age, sex, and race. Interaction terms were included to assess whether associations between mealtime behavior problems, spousal stress, and influence on family members and high food selectivity differed for children with ASD and TD children. No statistically significant interactions were detected and separate models were fit for children with ASD and TD children to calculate parameter estimates.

Statistical analyses were conducted using Stata 12.0 (StataCorp, College Station, TX, USA), with statistical significance set at $p < 0.05$.

RESULTS

The study included 53 children with ASD and 58 TD children and their parents. Mothers were the primary respondents, with four fathers in each group. Mean age, sex, race, and parental education status were similar in the two groups. TD children were more likely to be an only child than were children with ASD (26% and 11% respectively, p=0.05). Parents of TD children were also more likely than parents of children with ASD to have never been married (12% and 0% respectively, p=0.05). We set the cut-point to define high food selectivity at the highest quartile of refusal of food among TD children, which corresponded to refusing 33% or more of foods offered. Using this criterion, children with ASD were more likely to have high food selectivity than TD children (66% and 24% respectively, p<0.01). Participant demographic characteristics are shown in Table 1.

Children with ASD had a greater frequency of mealtime behavior problems than did TD children (mean of frequency scale scores 19.7 vs. 12.0, p<0.01) (Table 2). Compared to parents of TD children, spousal stress was higher among parents of children with ASD (n=49 and 51, respectively; mean of spousal stress scale scores 10.7 vs. 6.9, p<0.01). Parents of children with ASD were also more likely to report that their child's food preferences influenced what other family members ate (mean influence scale scores 6.2 vs. 4.2, p<0.01). It was more common for parents of children with ASD than parents of TD children to endorse each of the individual items in each of these scales with large differences in proportions evident for many items. Children with ASD and TD children were most similar relative to arguing about what is eaten (17% vs 10%, p=0.31) and the influence of the child's food preferences on what the parent respondent eats (19% vs 10%, p=0.20).

High food selectivity was associated in multivariable regression models with greater reported frequency of mealtime behavior problems in both groups ($\beta = 5.44$ in ASD, p=0.003; $\beta = 3.45$ in TD, p=0.04) (Table 3). The magnitude of this effect was more than 0.5 standard deviations in TD children and almost 1 SD in children with ASD. The relationship between food selectivity and spousal stress was in the hypothesized direction in both groups and approached statistical significance for families of TD children ($\beta = 2.01$, p=0.07). In families of children with ASD, the effect of food selectivity was smaller and not statistically significant ($\beta = 1.04$, p=0.44). Food selectivity was not strongly associated with what other family members ate in either group ($\beta = 0.52$ in ASD, p=0.56; $\beta = 0.89$ in TD, p=0.27).

DISCUSSION

The present study sought to build upon the contributions of qualitative studies that have characterized the mealtime experiences of families of children with ASD as stressful and dissatisfying (Ausderau and Juarez 2013). We explored the relationship between mealtime problems and food selectivity in children with ASD and TD children and examined the nature, frequency, and extent of children's mealtime behavior problems, spousal stress at

mealtimes, and influence on family members' food choices between children with ASD and TD children.

We found that compared to parents of TD children, parents of children with ASD were more likely to report mealtime behavioral problems, spousal stress at meals, and that their child's food preferences influenced what other family members ate. A high refusal of food, which we used as our measure of food selectivity, was associated with mealtime behavior problems in both groups. The relationship between spousal stress and food selectivity in TD children was of borderline statistical significance, but was not statistically significant in children with ASD. We observed little evidence that high food refusal influenced what other family members ate in either group of children. Our quantitative findings are consistent with previous qualitative studies reporting that mealtimes are a source of stress for families of children with ASD (Ausderau & Juarez, 2013; Marquenie, Rodger, Mangohig, & Cronin, 2011).

Food selectivity and mealtime behavior problems may be appropriate targets for therapeutic intervention for all children, regardless of autism status. Martins *et al*. (2008) found that children with ASD and TD children experience similar types of feeding problems, but the frequency with which they exhibit these problematic behaviors differs (Martins et al. 2008). Several case reports and small studies have documented the efficacy of behavioral methods in addressing food selectivity and associated mealtime behavior problems in children generally, including those with autism (Matson & Fodstad, 2009; Piazza et al., 2003; Piazza, 2008). Notably, in a systematic review of psychological interventions for pediatric feeding problems, Lukens and colleagues note that few randomized controlled trials exist on pediatric feeding interventions, which limits the ability to identify the interventional approaches or components that are most effective in treating children's feeding problems generally (Lukens & Silverman, 2014).

Our findings that mealtime behaviors are related to food selectivity and parental stress provides support for further research on interventions designed to increase food variety in children with ASD. In our study we used a quantitative measure of food selectivity to assess the number of different foods a child refuses, not the volume of food a child would accept. In a recent systematic review and meta-analysis of interventions for children up to 6 years of age, Marshall *et al.* concluded that while there is evidence for interventions that increase the amount of food eaten, less evidence exists for interventions that increase food variety (Marshall, Ware, Ziviani, Hill, & Dodrill, 2014). In a large study of children aged 3–12 years, Laud *et al.* (2009) demonstrated the efficacy of an intensive interdisciplinary behavioral program to decrease food refusal and increase variety in 46 children with severe feeding problems, several of whom had medical comorbidities, and were hospitalized on an inpatient facility or enrolled in an intensive day treatment program (Laud, Girolami, Boscoe, & Gulotta, 2009). However, not all children with feeding problems require such intensive interventions, and thus additional research on interventions of varied intensities is warranted. In a pilot study of a behaviorally-based parent training intervention to address feeding problems in children with ASD, parental stress was decreased (Sharp, Burrell, & Jaquess, 2014). Although no significant changes in food variety or mealtime problems were

observed, this treatment approach provides preliminary support for continued research on parent-based interventions.

The inter-relationships among core symptoms of autism, food selectivity, and mealtime behavior problems are a related area worthy of future research. It has been suggested that disruptive mealtime behaviors observed in children with ASD may be related to the presence of repetitive and restricted behavior patterns as well as the core social/communication deficits that characterize the disorder. Qualitative studies have described social and communication deficits and the "need for sameness" as a source of disruptive mealtime behaviors (Ausderau and Juarez 2013; Rogers et al. 2012). However, these findings have not been consistently supported by quantitative studies. Johnson et al. found no association between mealtime feeding behaviors and social/communication deficits among 256 children with ASD, but did find a strong association among mealtime behaviors and repetitive/ritualistic behaviors, sensory impairments, and externalizing and internalizing behavior (Johnson et al. 2014).

Family meals are associated with child well-being, family functioning (Fiese et al. 2006), and better diet quality among children and adolescents (Gillman et al. 2000; Neumark-Sztainer et al. 2003). Future work in this area might focus on informing family-centered approaches that can address the unique risk factors that families of children with ASD face during mealtimes. It is critical for clinicians of various backgrounds (e.g., pediatricians, social workers, dietitians, occupational therapists, etc.) to understand the implications of these risks among families of children with ASD relative to other children.

Our study has a number of strengths. To our knowledge, only two prior studies attempted to develop criteria to classify highly selective eating. Zimmer *et al*. categorized children with ASD as being "selective" or "non-selective" based on a food variety score 1 standard deviation or more below the mean of the TD children (Zimmer et al. 2012). Suarez *et al*. characterized food selectivity as typical, moderate, and severe, based on the number of foods accepted (Suarez et al. 2012). In the present analysis, we created a cut-point to characterize children as having high food selectivity derived from the highest quartile of refused foods among TD children, which corresponded to refusal of one-third or more of foods offered. There is no standard definition of food selectivity, and despite a growing body of literature concerning feeding problems in children with ASD, no consensus approach to its assessment has yet emerged. Thus, assessments of risk related to selective eating in children with ASD remain equivocal, though the method we used may offer an approach to address the current gap in this area of research.

We acknowledge several limitations in the present study. The *Meals in Our Household* questionnaire assesses both objective and subjective aspects of family mealtimes. The domains assessed in the present study are a reflection of the perceptions of the parent and not a direct assessment of the child's behavior (Anderson et al. 2012). This questionnaire only queried spousal stress, not the stress of the respondent, and included only four stress-related questions. Future studies using other parenting stress measures would be informative, as would a comparison of whether mothers and fathers experience different aspects of their child's behavior to be stressful. Finally, a cross-sectional study like this one cannot provide

information about temporality. Prospective studies with repeated measures of mealtime behaviors and these outcomes are needed to establish the directionality of these associations and better understand their stability.

Conclusion

Little work has been done to examine associations of food selectivity with mealtime behavioral problems, parental stress at mealtimes, and influence on what family members eat. We have demonstrated that parents of children with ASD report a greater frequency of mealtime behavior problems and negative impacts on family members, and children with ASD are more likely to exhibit high food selectivity than TD children. High food refusal was associated with mealtime behavior problems in both groups with no evidence of a differential effect between children with ASD and TD children. Together, these findings suggest that families of children with ASD may be at an increased risk of higher parental stress at mealtimes. Both high food selectivity and mealtime behavior problems represent appropriate targets for therapeutic intervention.

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Table 1

Participant Demographic Characteristics

	Autism N=53	Typically Developing N=58	p-value*
Age (years): mean±SD	6.6± 2.1	6.7 ± 2.4	0.75
Race: n (%)			0.15
White	48 (91)	47 (81)	
Non-white	5 (9)	11 (19)	
Sex: n (%)			0.47
Male	44 (83)	45 (78)	
Female	9 (17)	13 (22)	
Maternal education: n (%)			
≥ college degree	39 (74)	42 (72)	0.89
Paternal education			
≥ college degree	28 (54)	39 (67)	0.15
One or more parent with college degree: n (%)	43 (81)	47 (81)	0.99
Marital status: n (%)			0.05
Married	50 (94)	48 (83)	
Widowed	1 (2)	0 (0)	
Separated/divorced	2 (4)	3 (5)	
Never married	0 (0)	7 (12)	
Child is an only child: n (%)	6 (11)	15 (26)	0.05

* p-values from chi-square tests except for age where independent samples t-test was used.

Table 2

Problematic mealtime behaviors, spousal stress, and influence on family meals from *Meals in Our Household* questionnaire in children with and without ASD

	ASD N=53 n (%)	Typically Developing N=58 n (%)	p-value‡
Frequency of Problematic Child Mealtime Behaviors (10 items)			
My child refuses to come when it is time to eat[a]	13 (25)	2 (4)	0.001
My child has tantrums or acts out during meals[a]	10 (19)	0 (0)	0.001
My child complains about what is served[a]	16 (30)	7 (12)	0.02
I argue with my child about what he/she eats[a]	9 (17)	6 (10)	0.31
My child seeks a lot of attention during meals[a]	12 (23)	5 (9)	0.04
My child does not stay seated during meals[a]	26 (49)	11 (19)	0.001
My child squirms or fidgets while eating[a]	29 (55)	15 (26)	0.002
My child has poor table manners[a]	16 (30)	2 (4)	<0.001
My child overstuffs his/her mouth with food[a]	16 (30)	1 (2)	<0.001
My child refuses to eat what is served[a]	20 (38)	5 (9)	<0.001
Frequency of Problematic Mealtime Behaviors Scale: mean (SD)[1]	19.7 (6)	12.0 (6)	<0.001
Spousal Stress Related to Child's Mealtime Behaviors (4 items)*			
My child's behavior at meals bothers my spouse/partner[b]	28 (55)	11 (23)	0.001
My spouse/partner does not enjoy eating with my child[b]	11 (22)	3 (6)	0.03
My child's mealtime behavior is a source of stress in my relationship with my spouse/partner[b]	12 (24)	2 (4)	0.005
My spouse/partner and I have different expectations about my child's mealtime behavior[b]	20 (39)	5 (10)	0.001
Spousal Stress at Mealtimes domain score; mean (SD)[2]	10.7 (4)	6.9 (3)	<0.001
Influence of Child's Food Preferences on what other Family Members Eat (3 items)**			
My child's food preferences influence what I, myself, eat[c]	10 (19)	6 (10)	0.20
My child's food preferences influence what my spouse/partner eats[b]	14 (28)	4 (8)	0.01
My child's food preferences influence what other children in our household eat[b, **]	16 (36)	7 (17)	0.046
Child Influences Family Food Choices at Mealtimes domain score: mean (SD)[3]	6.2 (3)	4.2 (3)	<0.001

* questions requiring a spouse or partner were not asked when not applicable: n=51 for families of children with ASD; n=49 for families of TD children

** questions requiring a sibling living in the home were not asked when not applicable: n=45 for families of children with ASD; n=42 for families of TD children

‡ significance of Chi-Square test

[a] Response of "often" or "very often"

[b] Response of "agree" or "strongly agree"

[c] Response of "always or almost always"

[1] Higher scores indicate greater frequency of parent-reported child mealtime behavior problems

[2]Higher scores indicate greater impact of parent-reported child's mealtime behavior on stress in the relationship with spouse/partner

[3]Higher scores indicate more influence of the parent-reported child's food preferences on what self and other family members ate.

Table 3

Linear regression models of frequency of child mealtime behavior problems, spousal stress at mealtimes, and influence on what others in the family eat with high food refusal in children with ASD and in typically developing (TD) children[1]

	ASD (n=53)			TD (n=58)		
	β	**95% CI**	**p-value**	**β**	**95% CI**	**p-value**
Domains:						
Frequency of Child Mealtime Behavior Problems	5.44	1.93, 8.95	0.003	3.45	0.25, 6.66	0.04
Spousal Stress at Mealtimes	1.04	−1.66, 3.75	0.44	2.01	−0.13, 4.16	0.07
Influence on what family eats	0.52	−1.23, 2.27	0.56	0.89	−0.72, 2.50	0.27

[1] Beta coefficients, 95% confidence intervals, and p-values from linear regression models, adjusting for age, sex, and race