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Associations Between Autism Symptom Severity and Mealtime Behaviors in Young Children Presented with an Unfamiliar Food

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Abstract

Background—Feeding problems are common in children with Autism Spectrum Disorder (ASD), and there are associations between parent reports of child ASD symptom severity and feeding problems. The current study further explores this association between ASD severity and family mealtime behaviors using directly observed naturalistic mealtime interactions.

Methods and Procedures—Seventy-three children (M_{age} = 5.42 years) were presented an unfamiliar food during a videotaped but otherwise typical home meal. Mealtime behavior was assessed through coding of the videotaped meal using the Dyadic Interaction Nomenclature for Eating (DINE) and parent report (Brief ASD Mealtime Behavior Inventory; BAMBI). ASD severity was assessed with the clinician-completed Childhood Autism Rating Scale-Second Edition (CARS-2). Outcomes and Results: Greater ASD severity was associated with fewer bites

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Pan, Teresa: Data acquisition, curation, writing (review and editing)
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of the unfamiliar food, greater disruptive behavior during meals, and greater parental commands to take bites during meals. We found negative associations between limited food variety and food refusal (BAMBI subscales) and child bites of the unfamiliar food, with higher levels of limited food variety and food refusal associated with fewer bites of the unfamiliar food.

Conclusions and Implications—Children with more severe ASD may eat less and be more disruptive during meals, despite parent redirection. We also found associations between the BAMBI and DINE which suggest the BAMBI may be a sensitive measure of mealtime behaviors such as food flexibility and food refusal.

Keywords

Autism Spectrum Disorder; Mealtime Behavior; Feeding

1. Introduction

Autism spectrum disorder (ASD) is a developmental disorder that affects 1 in 59 children (Centers for Disease Control and Prevention; CDC, 2018). ASD is characterized by persistent deficits in social communication and interaction across multiple settings, as well as restricted patterns of behavior, interests, or activities, including strong preferences for specific items, routines, or patterns of behavior (American Psychiatric Association, 2013). However, children with ASD can also frequently display sensory sensitivities, such as hypo- or hyper- sensitivity to light, sound, touch or texture, taste, and smell (Tomchek & Dunn, 2007) and many experience problems with feeding and eating. Indeed, multiple studies report that children with ASD are more likely than typically developing peers to have feeding problems (Cermak, Curtin, & Bandini, 2010; Ledford & Gast, 2006; Sharp et al., 2013; Provost, Crowe, Obsourn, McClain, & Skipper, 2010). Moreover, within a sample of young children with ASD, researchers have found 80% of young children were “picky eaters” as described by their parents and 95% resisted trying new foods (Lockner, Crowe, & Skipper, 2008).

Several hypotheses exist for why there is such a high prevalence of feeding problems in young children with ASD. Feeding problems may occur in young children with ASD due to the occurrence of gastrointestinal problems, sensory impairments, and oral and fine motor skills deficits (Cornish, 1998; Dailey, 2009; Cumine, Leach, & Stevenson, 2000; Rutter, 2006). Another hypothesis is that these problems represent a mealtime extension of the general restricted behaviors and interests that are characteristic of ASD. In support of the hypothesis that the symptoms are related to behavioral characteristics of ASD, studies have shown an association between greater parent-reported child feeding difficulties and more severe parent-reported child ASD symptoms and sensory sensitives (Allen et al., 2015; Johnson et al., 2014; Lukens & Linscheid, 2008; Zobel-Lachiusa, Andrianopoulos, Maillouz, & Cermak, 2015). However, while past research has found parent-report of ASD and sensory symptoms are related to parent-report of child mealtime behaviors, a similar relationship has not been found when standardized assessments of ASD symptoms [e.g., Autism Diagnostic Observation Schedule (ADOS)] are used (Allen et al., 2015; Johnson et al., 2014). Moreover, it remains to be determined if child ASD symptom severity is

associated with observed child mealtime behaviors and to child mealtime behaviors captured in the naturalistic home versus in the clinic.

The current study seeks to address these gaps in the literature by examining ASD symptom severity and family mealtime behaviors, based on both parent-report and direct observation, in the home. Specifically, we hypothesized that greater ASD symptom severity would relate to greater problematic mealtime behaviors (both parent-report and directly observed mealtime problems). Additionally, we conducted an exploratory analysis to examine potential relations between parent-reported mealtime problems and directly observed behaviors as a measure of concurrent validity.

2. Methods

2.1 Participants

Seventy-three families with a child with ASD (ages 2–8 years), who enrolled in a larger study examining mealtime and dietary factors related to child weight status, completed the measures necessary for inclusion in the current study. Inclusion criteria were a child diagnosis of ASD, as determined by a child psychologist, psychiatrist, or developmental pediatrician using standardized procedures, and that the family was English-speaking. Families were excluded if children received 100% of their nutrition from a gastrostomy tube or if children were living in foster care. Families of children who were 1) currently receiving services for ASD, 2) had previously received an ASD assessment, or 3) who had previously received services and agreed to be contacted later about potential research opportunities were recruited.

2.2 Procedures

We obtained Institutional Review Board approval for the larger study prior to family enrollment. We recruited families from one of two hospitals in the mid-western United States. Families completed the study procedures in two home visits. In the first home visit, we obtained written informed consent, taught parents how to videotape at least four family home meals using study-provided equipment, and measured the child's height and weight based on a standardized protocol. During visit one, study personnel also worked with families to identify an unfamiliar food personalized for their child. To identify an unfamiliar food, first, study personnel offered parents five standard food options (canned pears = fruit, canned green beans = vegetable, canned baked beans = protein, box of stovetop stuffing = starch, prepackaged, light yogurt = dairy) corresponding to five food categories that children with ASD consume less of in comparison to their family members (Schreck & Williams, 2006). However, in cases where children were already familiar with these foods, the study personnel and parents identified an alternative food based on a list of similar foods (e.g., broccoli, spinach, kiwi, and asparagus). Study personnel instructed parents to present the food as they might normally do during the final videotaped meal. Families were instructed not to mix the food with another food (so that the number of bites consumed of the new food specifically could be observed). During the second home visit, study personnel collected all of the questionnaires and study supplies and reimbursed families with a $20 gift card for their time and participation.

2.3 Measures

2.3.1 *Dyadic Interaction Nomenclature for Eating (DINE;* Stark et al., 1995)—

We coded directly observed family mealtime behaviors using the *DINE*, a valid measure of Child Eating behavior, Child Behavior, and Parent Behavior. Child Eating behaviors include bites, sips, and spit-outs. Child Behaviors consist of Noncompliance to Direct Commands, Refusal/Complaints about Food, Requests for Food, Child Talk, and Away from Table/Food. Parent Behaviors consist of Direct Commands, Ineffective Commands, Coaxing, Reinforcing, Parent Talk, Physical Prompts, and Feeding the child. For the current study, we added an additional behavior to code for in addition to all of the standard behaviors, which was *bites of an unfamiliar food,* which we operationalized as, "Taking a bite of an unfamiliar food into the mouth during the recorded meal." Graduate students in dietetics and psychology served as coders for this study. All coders achieved a minimum reliability (Kappa > .60) prior to coding the study videos. Following the standardized process established by Stark et al., 1995, we coded 30% of the videos. In the current study, final kappa coefficients for behaviors were: .76 (child behaviors), .87 (child eating behaviors), and .69 (parent behaviors), which exceed the minimum (kappa >.60) for reliability. The *DINE* has been previously used in several pediatric populations with strong evidence supporting its validity and reliability (e.g., cystic fibrosis, type 1 diabetes, ASD; Odar Stough, Dreyer Gillette, Roberts, Jorgenson, & Patton, 2015; Patton, Odar, Midyett, & Clements, 2014; Stark et al., 1995).

2.3.2 Brief ASD Mealtime Behavior Inventory (BAMBI; Lukens & Linscheid, 2008)—

We assessed parent-report of mealtime behaviors using the 18-item *BAMBI,* a standardized measure of mealtime behaviors in children with ASD. The measure produces a total score and 3 subscale scores: Limited Variety of Foods, Food Refusal, and Features of ASD. To complete the BAMBI, parents report on the frequency at which certain child mealtime behaviors occur using a Likert scale ranging from 1 (Never/Rarely) to 5 (At Almost Every Meal). Higher scores represent greater frequency of problematic behaviors. There is evidence of adequate reliability for the BAMBI based on internal consistency scores: Total Score α = .88, Limited Variety α = .87, Food Refusal α = .76, and Features of ASD α = .63 (Lukens & Linscheid, 2008). In the current sample, internal consistency was α = .73 for the Total Score, α = .73 for the Limited Variety of Foods subscale, α = .62 for the Food Refusal Scale, and α = .34 for the Features of ASD subscale.

2.3.4 *Childhood Autism Rating Scale, Second Edition (CARS-2-ST;* Schopler, Van Bourgondien, & Wellman, 2010)—

We used the CARS-2 as a measure of autism severity based on information obtained through a clinical psychology graduate student's interaction with the child during study visits and parent-report on the questionnaire. While our goal was to complete the CARS-2 at the first home visit, we were willing to complete it at the second visit if needed to accommodate the family's schedule. During home visits, a trained clinical psychology graduate student interacted with the child for 30 minutes, while the parent completed the corresponding questionnaire. The measure includes 15 items on which clinicians rate child behaviors on a 4-point Likert scale. Domains assessed include Relating to People, Communication, Responsiveness, and Activity Level. For the current study, we used children's Total CARS-2 score. The CARS-2-Standard Form was selected a

priori to be administered for all participants, even for those who might have been higher functioning and above the recommended age range. We elected to use the same form for all participants to enable us to have comparable scales across all participants and since our intent was to evaluate autism severity and not to make an autism diagnosis.

2.4 Data Analysis

Data from the meal in which parents presented the unfamiliar food were used in analyses due to our interest in children's reaction to these foods. Prior to analyses, we examined the normality and distributions of the study variables and finding some non-normal distributions, made the decision to use Spearman correlations to calculate the relations between 1) CARS-2 total score and observed DINE behaviors, 2) CARS-2 total score and parent-report BAMBI behaviors, 3) BAMBI total score and observed DINE behaviors, and 4) BAMBI subscale scores (Features of ASD, Food Refusal, Limited Variety) and DINE behaviors. In order to account for the influence of meal length on behavior frequency, we calculated the rate for each mealtime behavior (e.g., frequency of the behavior divided by meal length) and used rate in our correlations. Given the exploratory nature of our analyses, we opted not to correct for multiple associations, but note this as a potential study limitation.

3. Results

Children had a mean age of 5.42 years (SD = 1.88) and were primarily male (77%), Caucasian (64%), and healthy weight (73%). Children's average CARS-2 score was 34.05 (SD = 6.22), representing mild to moderate symptoms of ASD. See Table 1 for the remaining demographics. Videotaped meals lasted on average 17.74 minutes (SD = 11.52). Of the 73 meals recorded, 53 were dinners (73%), 16 were lunches (22%), and no information was provided for 4 meals (5%). Parents were present within the video recordings (either physically or with voice) at 81% of the meals. Regarding bites of the unfamiliar food presented at the mealtime, 40 children (55%) took a bite of the unfamiliar food. Children who ate the unfamiliar food took on average 6.38 bites (SD = 6.50, range 1–28).

3.1 CARS-2 Total Score, Observed Mealtime Behaviors (DINE), and Parent-report Mealtime Behaviors (BAMBI)

In partial support of our hypothesis, we found negative correlations between child ASD severity (i.e., CARS-2 total score) and the directly observed rate of child bites of the unfamiliar food ($r_s = -.34$, $p = .005$) and observed child requests for food (includes nonverbal gestures, such as pointing, $r_s = -.42$, $p < .001$), suggesting that the children with more severe ASD symptoms were also less likely to eat the new food or to request any food during the meal. Similarly, when evaluating parent behaviors, we found positive associations between ASD severity and the observed rate of ineffective parental commands to eat ($r_s = .25$, $p = .04$) and the observed rate of parent feeds (e.g., spoon feeding; $r_s = .51$, $p < .001$), suggesting a tendency among parents of children with more severe ASD symptoms to provide more mealtime assistance with feeding but also to issue commands that don't result in eating. However, contrary to our hypothesis, we found negative associations between ASD severity and observed child talk (includes nonverbal vocalizations in children who are

minimally verbal; r_S = −.27, p = .03), the child observed being away from the table (r_S = −.35, p = .004), and observed child compliance to parental commands to eat (r_S = −.26, p = .03). Talking and being away from the table during a meal can reflect disruptive mealtime behaviors in that they can reduce child eating during the meal, but here we found that they were not necessarily behaviors consistent with more severe autism symptoms. The negative association observed between child compliance to parental commands and ASD severity does appear to follow our hypothesized direction. The correlations for all the associations between the CARS-2 total score and *DINE* behaviors are presented in Table 2.

Also contrary to our hypothesis, we did not observe any significant associations between children's CARS-2 total scores and parent-reported mealtime behaviors using the BAMBI (i.e., total behaviors, Limited Diet Variety, Features of ASD, or Food Refusal). See Table 3 for these correlational values.

3.2 BAMBI Total and Subscale Scores and Observed DINE Mealtime Behaviors

We found two significant associations when assessing parent-reported mealtime behaviors using the BAMBI relative to directly observed behaviors using the DINE. We observed a negative association between children's BAMBI Total Score and their observed rate of bites of the unfamiliar food (r_S = − .25, p = .04). We also identified a positive association between children's BAMBI Total Score and the observed rate of child talk (r_S = .31, p = .01), indicating that as ASD behaviors increased so did the frequency of child verbalizations. In both cases, these associations follow the hypothesized direction because they suggest children with more severe ASD symptoms also experience more problematic mealtime behaviors. However, we found no other significant associations between children's BAMBI Total Score and other child eating, child, or parent behaviors.

Examining subscales of the BAMBI, we found greater scores on parent-report of Features of ASD at mealtimes were related to fewer observed child sips (r_S = − .28, p = .02) and observed child requests for food (r_S = − .24, p = .04) but not to any other observed child eating, child behaviors, or parent behaviors. We found greater scores on the BAMBI Food Refusal subscale related to higher observed rate of parents feeding their child (r_S = .35, p = .002), parent talk (r_S = .25, p = .03), child talk (r_S = .23, p = .05), and child food refusals/complaints about food (r_S = .33, p = .01), but not to other *DINE* behaviors. Finally, we found a negative association between the BAMBI Limited Variety subscale and observed child bites of the unfamiliar food (r_S = − .31, p = .01), but positive associations between this variable and observed child talk (r_S = .30, p = .01) and child play (r_S = .25, p = .03). In this case, limited variety refers to willingness to try new foods and preferences about the type and presentation of foods, such that the more limited a child is in the variety of foods that he or she eats, the more likely they are to engage in conversation or yelling that would prevent them from eating or might distract parents from getting them to eat. Similarly, they may be more likely to play with foods that are not presented in the way that they are requested (e.g., if not prepared as requested or not in the correct color of cup). See Table 4 for a complete list of correlations.

4. Discussion

We examined associations between child ASD symptom severity, parent-report of mealtime behaviors, and observed family mealtime behaviors. In our procedure, we asked parents to present an unfamiliar food to their child during the home meal. We did this because past research has reported that young children with ASD tend to have more restricted food repertoires, and we wanted to observe children's reaction to an unfamiliar food while they were in a familiar setting (e.g., home). Consistent with the previous literature, we found that children with greater ASD severity took fewer bites of the unfamiliar food. Moreover, our results extend existing evidence because we are the first to demonstrate this relationship using clinician/researcher-rated ASD severity as opposed to parent-report of symptom severity (Allen et al., 2015; Johnson et al., 2014; Zobel-Lachiusa et al., 2015). Finally, our study extends the existing literature because we used direct observation of family meals within the home in addition to parent-reported behaviors.

However, some of our results were contrary to our hypotheses. Specifically, we found associations between greater ASD severity and less child talk (including verbalizations) and child away from the table, which are two mealtime behaviors typically considered disruptive because they can impede child eating. It is possible we saw these associations because of the occurrence of comorbid motor and verbal impairments which can sometimes present with more severe ASD symptoms and could themselves impede child talk and moving away from the table. Interestingly, in partial support of our hypothesis, we saw a positive association between child ASD severity and parents' use of ineffective commands to eat. In the DINE, we code ineffective commands when parents issue multiple commands in succession without waiting for the child to respond and when parents issue a command but then distract the child by talking to him/her or coaxing him/her to eat. We suspect we saw a relationship between greater child ASD severity and more ineffective parent commands because parents are perceiving their child with ASD to be less responsive and thus are more likely to issue multiple commands in succession or combine commands with coaxes in attempts to encourage their child to eat. Notably, we received partial support for our hypothesis in the observed negative association between child ASD severity and child compliance to parent commands, which suggested children with more severe symptoms were also less responsive to their parents' commands to eat.

Contrary to existing studies (e.g., Lukens and Linsheid 2008) and to our hypothesis, we did not find any significant associations between child ASD severity and parent-report of problematic mealtime behaviors via the BAMBI. It is possible that this occurred because parents of children with greater ASD symptoms have habituated to their child's problematic behaviors, and therefore, do not perceive their child's mealtime behavior as problematic, leading them to endorse very few of the BAMBI items. It is also possible this occurred because of our study procedure. Unlike existing studies which used parent-reported ASD severity (Allen et al., 2015; Johnson et al., 2014; Zobel-Lachiusa et al., 2015), we used clinician/researcher reported ASD severity. Perhaps the other studies found this relation because, in asking parents to report their child's overall ASD severity, these studies also primed parents to look for problematic behaviors more generally leading to more perceived mealtime problems.

Our study has some unique findings when we examined the relationships between the subscales on the BAMBI and the directly observed DINE behaviors. For example, we found parent-report of greater BAMBI Total Score for problematic mealtime behaviors and Limited Diet Variety negatively associated with the child taking bites of the unfamiliar food. These relations offer some concurrent validity for the BAMBI as a measure of child food flexibility. Additionally, we found an association between parent-report of child food refusal on the BAMBI and observed child food refusals using the *DINE,* which suggests it may be valid to measure child food refusal based on parent report on the BAMBI. The lack of associations between other BAMBI subscales and the DINE are not entirely surprising because there are some differences in the two measures. For example, the BAMBI focuses on parents' perceptions of child mealtime behaviors, while the DINE codes for actual child eating, child, and parent behaviors. It would follow that parent and some child eating behaviors (e.g., bites, sips) may not correlate with parent-reported problematic child mealtime behaviors. The BAMBI also includes a subscale which assesses Features of ASD, but the behavioral items that comprise this subscale do not map directly to DINE behaviors. Our analyses provide additional directly observed support for the validity of the BAMBI in identifying children who have challenges with limited variety and foods refusal and whom should have further evaluation by a clinician. Given the substantially smaller time and resource investment to complete the BAMBI, which has also been reported on as a 10 and 15 item measure, this study provides support for its utility in clinical work and research in detecting these feeding challenges.

4.1 Limitations and Future Directions

Our study is limited by the fact that families knew that they were being observed during the mealtimes and the current results represent the mealtime interactions during the final one of four meals, which hopefully reduced the possibility of the Hawthorne effect. We selected videotaping in the home to create a comfortable eating situation for the children with ASD. Only one unfamiliar food was presented, and in order to accurately count the bites of the food, families were asked not to mix it with other foods (a strategy some families use to get children to try novel foods). While our coding system was extremely detailed, we have some questions that cannot be answered, such as how much the child interacted with the food outside of actually passing the food through the threshold of the mouth (defined as a bite). We purposefully did not give the parents any directions regarding how to present the unfamiliar food other than not to mix it so as to not bias how the food was provided or presented. Using a standardized measure such as the ADOS rather than a screening measure (i.e., CARS-2) and clinician diagnosis would have strengthened the study. Finally, the graduate student researchers completing the CARS-2 were not blinded to the feeding assessment. The internal consistency was low on some of the BAMBI subscales, and particularly low on the Features of ASD subscale, which may impact our power to detect differences or influence results. It is not clear why we found such a low measure of internal consistency on the Features of ASD subscale in our sample, but suspect this could relate to the variability of the behaviors being assessed which include both aggression/self-injurious behaviors as well as rigidity around mealtimes. We considered utilizing one of the other models of the BAMBI, but in evaluating our results, we felt like it was most valuable to include all of the items. Finally, we did not have questionnaires or behavioral ratings

specifically assessing sensory sensitivity or reactions to foods, which we recommend for future research.

4.2 Clinical Implications and Conclusions

Within the context of these limitations, we believe our study offers several clinical implications. First, our data reinforce the important of inquiring about potential feeding problems when working with children with ASD because feeding problems can be a significant source of family stress and risk factor for nutritional or medical complications. Second, because we found evidence suggesting that children with more severe ASD may also be less likely to try new foods, our study highlights the need to address diet and feeding difficulties in children with ASD. While this may not be effective for children at the most severe levels of feeding difficulties, in our clinical experience and a previous study, we found that approximately half the time, presenting a novel food and simply asking the child to eat the food led to the child taking bites, suggesting some initial efficacy for this strategy (Odar Stough et al., 2015). Thus, the combination of having new foods available and giving effective commands may be effective for those children with more mild degrees of food selectivity. If parents learn to give more effective commands and, in turn, children are more compliant to parent commands, this could also reduce stress during meals as well as lead to a better child diet. Third, although contrary to our hypothesis, our finding that ASD symptom severity negatively correlated with typically disruptive child mealtime behaviors, such as the child talking and being away from the table, highlights the importance of also considering mealtime behaviors as a potential treatment target for children with less severe ASD symptomology. Finally, given that such a high prevalence of children with ASD would be rated as having limited food variety, it can be easy for parents to feel defeated and only serve a small number of items. However, the general literature supports the strategy of using multiple presentations of new foods in order to help expand a child's food variety over time. Our data here remind the clinician to counsel parents to be patient when presenting new foods and not to give up prematurely as, in cases where ASD is more severe, it may take much longer for the child accept a new food into their food repertoire.

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What this paper adds?

- This paper examines observational data of child and parent mealtime behaviors during presentation of an unfamiliar food and reports on the relationship of these behaviors to child ASD severity.
- Findings show negative correlations between child ASD severity and rates of bites and child requests for food. The results also show positive correlations between child ASD severity and rates of parent feeds and ineffective parent commands to eat. There were significant associations between parent-reported mealtime behavior challenges (e.g., food refusal, food flexibility) and observed mealtime behaviors, providing concurrent evidence for using a brief parent-report screener of mealtime behaviors in families of children with ASD.
- Strengths of this paper include the use of multimodal methods of assessment, well-validated tools, and in-home assessment of family mealtime behaviors in children who often behave differently outside of the home setting.
- We believe that this paper reinforces the evidence suggesting a link between child ASD severity and family mealtime behaviors. The results also offer support for screening measures that might be clinically useful in brief encounters given the high prevalence of feeding difficulties in children with ASD.

Table 1:

Participant Demographics

	n = 73
Gender	
Male	56 (77%)
Female	17 (23%)
Race	
Caucasian	47 (64%)
African American	12 (17%)
Biracial	10 (14%)
Latino	3 (4%)
Missing	1 (1%)
Income	
$0– $19,999	15 (21%)
$ 20,000– $39, 999	12 (16%)
$40, 000– $59, 999	10 (14%)
$60, 000– $79, 999	12 (16%)
$80, 000– $99, 999	4 (6%)
$100, 000 +	14 (19%)
Missing	6 (8%)
Weight Status	
Under Weight (BMI %tile < 5^{th})	1 (1%)
Normal Weight (BMI %tile 5^{th}– 85^{th})	53 (73%)
Overweight (BMI %tile 85^{th}– 95^{th})	10 (14%)
Obese (BMI %tile > 95^{th})	9 (12%)

Table 2:

CARS Relationships to Observed Mealtime Behaviors

	CARS Total Score
Eating Behaviors	
Bites (B)	$r_s = .09$
Target Bites (TB)	$r_s = -.34^{+}$
Sips (S)	$r_s = -.19$
Spit-ups (Sp)	$r_s = .01$
Feed (F)	$r_s = .51^{**}$
Plate Away (NP)	$r_s = .05$
Child Behaviors	
Child Talk (CT)	$r_s = -.27^{*}$
Crying (Cr)	$r_s = .05$
Food Refusals/Complaints about Food (R)	$r_s = -.11$
Play (P)	$r_s = .02$
Away (A)	$r_s = -.35^{+}$
Requests for Food (Q)	$r_s = -.42^{**}$
Parent Behaviors	
Alpha Commands (C)	$r_s = -.10$
Alpha Commands Followed by Compliance (C+)	$r_s = -.26^{*}$
Alpha Commands Followed by Non-Compliance (C−)	$r_s = -.12$
Beta Commands (C/)	$r_s = .25^{*}$
Coaxing (CX)	$r_s = -.18$
Reinforcement (RN)	$r_s = -.04$
Parent Talk (PT)	$r_s = -.18$
Physical Prompt (XP)	$r_s = .14$

$^{*}p < .05$

$^{+}p < .01$

$^{**}p < .001$

Table 3:

CARS Relationships to Parent-report Mealtime Behaviors

	BAMBI Total Score	BAMBI Features of ASD	BAMBI Food Refusal	BAMBI Limited Variety
CARS	r_s = .13, p = .31	r_s = .11, p = .39	r_s = .08, p = .55	r_s = .06, p = .64

Table 4:

Relationships Between Parent-report and Observed Mealtime Behaviors

	BAMBI Total Score	BAMBI Features of ASD	BAMBI Food Refusal	BAMBI Limited Variety
Eating Behaviors				
Bites (B)	$r_s = -.18$	$r_s = -.03$	$r_s = -.21$	$r_s = -.13$
Target Bites (TB)	$r_s = -.25^{*}$	$r_s = -.10$	$r_s = -.05$	$r_s = -.31^{+}$
Sips (S)	$r_s = -.14$	$r_s = -.28^{*}$	$r_s = -.13$	$r_s = .01$
Spit-ups (Sp)	$r_s = .01$	$r_s = .02$	$r_s = .21$	$r_s = -.07$
Feed (F)	$r_s = .12$	$r_s = .14$	$r_s = .35^{+}$	$r_s = -.06$
Plate Away (NP)	$r_s = -.15$	$r_s = -.05$	$r_s = .08$	$r_s = -.16$
Child Behaviors				
Child Talk (CT)	$r_s = .31^{+}$	$r_s = .09$	$r_s = .23^{*}$	$r_s = .30^{*}$
Crying (Cr)	$r_s = .10$	$r_s = .11$	$r_s = .13$	$r_s = .09$
Food Refusals/Complaints about Food (R)	$r_s = .17$	$r_s = .11$	$r_s = .33^{+}$	$r_s = .08$
Play (P)	$r_s = .20$	$r_s = .08$	$r_s = -.03$	$r_s = .25^{*}$
Away (A)	$r_s = .01$	$r_s = .04$	$r_s = -.03$	$r_s = -.02$
Parent Behaviors				
Alpha Commands (C)	$r_s = .08$	$r_s = .05$	$r_s = .15$	$r_s = 0.04$
Alpha Commands Followed by Compliance (C+)	$r_s = .05$	$r_s = .06$	$r_s = .04$	$r_s = .06$
Alpha Commands Followed by Non-Compliance (C−)	$r_s = .08$	$r_s = .01$	$r_s = .08$	$r_s = .07$
Beta Commands (C/)	$r_s = .19$	$r_s = .14$	$r_s = .19$	$r_s = .11$
Coaxing (CX)	$r_s = -.01$	$r_s = .08$	$r_s = .12$	$r_s = -.09$
Reinforcement (RN)	$r_s = -.02$	$r_s = .06$	$r_s = .08$	$r_s = -.04$
Parent Talk (PT)	$r_s = .12$	$r_s = .10$	$r_s = .25^{*}$	$r_s = .01$
Physical Prompt (XP)	$r_s = -.17$	$r_s = -.15$	$r_s = .03$	$r_s = -.15$

* $p < .05$

$^{+}$ $p < .01$

** $p < .001$