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The Screening Tool of Feeding Problems applied to children (STEP-CHILD): Psychometric characteristics and associations with child and parent variables

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ABSTRACT

The present study evaluated the 23-item Screening Tool for Feeding Problems (STEP; Matson & Kuhn, 2001) with a sample of children referred to a hospital-based feeding clinic to examine the scale's psychometric characteristics and then demonstrate how a children's revision of the STEP, the STEP-CHILD is associated with child and parent variables. Participants included 142 children (95 boys, 47 girls; mean age = 61.4 months; 43 with autism, 51 with other special needs, 48 with no special needs). Children ranged in age from 24 months to 18 years. Factor analysis revealed a 15-item STEP-CHILD with six subscales of child feeding problems: CHEWING PROBLEMS, RAPID EATING, FOOD REFUSAL, FOOD SELECTIVITY, VOMITING, and STEALING FOOD. Mediation analysis documented that "overly permissive" actions by parents (such as infrequent insistence on eating during meals, or frequent preparation of Special Meals for children different than the family meal) explained over 34% of the links between children's feeding problems and poor weight and diet outcomes.

The prevalence of feeding problems reported among children is high, with up to 25% of children reported to have a feeding problem of some degree across the span of childhood (Manikam & Perman, 2000). Among children with special needs, the prevalence rates have been found to be even higher, ranging up to one third of samples studied (Dahl & Sunderlin, 1986; Palmer & Horn, 1978, chap. 13). The types of feeding problems reported in the literature vary from food selectivity by type or texture to more severe problems such as food refusal or dysphasia (Field, Garland, & Williams, 2003). A thorough understanding of the prevalence and types of feeding problems that exist in different populations of children is complicated by the lack of standardized diagnostic criteria and measures for assessment (Kedesdy & Budd, 1998; Williams, Riegel, & Kerwin, 2009). In a recent article discussing the assessment of feeding problems among children with autism spectrum disorders, it was noted that there are only two questionnaires that specifically address the feeding problems in this population (Seiverling, Williams, & Sturmey, 2010). There are currently no questionnaires for the assessment of feeding problems of children with a wider range of special needs.

Matson and Kuhn (2001) developed a Screening Tool for Feeding Problems (STEP) to assess feeding behavior in adults with intellectual disabilities and to provide a method for clinicians in determining who would benefit from medical and behavioral intervention. In the STEP questionnaire, Matson and Kuhn targeted a variety of issues including: (a) risk of

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aspiration, (b) feeding skill deficits, (c) food refusal and associated behavior problems, (d) nutrition related behavior problems, and (e) food selectivity.

One purpose of the present study was to examine how well the 23-item STEP (Matson & Kuhn, 2001) could be used as a measure of feeding problems for a sample of children referred to a hospital-based feeding clinic. Since the original STEP measure was developed with a population of adults with disabilities, it may have limitations in its application to children with feeding problems. The impact of parent mealtime actions may also be particularly important when assessing feeding problems in children. In the current study, researchers examined parent mealtime actions using the 31-item and nine-subscale Parent Mealtime Action Scale (PMAS; Hendy, Williams, Camise, Eckman, & Hedgemann, 2009) and parent mealtime actions associated with parent ratings on the child version of the STEP, hereafter the STEP-CHILD.

In addition, the original STEP items and subscales were selected by authors' clinical experience and not based on the usual psychometric examination in scale development. In the original study, a factor analysis using the 23 items identified seven dimensions with two or more items each (with a mean internal reliability of 47.6); however, the authors created their own five dimensions (ASPIRATION RISK, SELECTIVITY, SKILLS, REFUSAL, and NUTRITION) based on clinical opinions of how the items co-occurred (with a mean internal reliability of 47.5 for these five STEP dimensions). In the present study, factor analysis was used to determine the items and subscales selected for the child version of the STEP. For each dimension of the STEP-CHILD, two or more items were required, every item demonstrated a factor loading of .40 or higher within one dimension only, and the Cronbach's alpha internal reliability score was .55 or higher. Additionally, a psychometrically tested measure of children's feeding problems, the 35-item and eight-subscale Child Eating Behavior Questionnaire (CEBQ; Wardle, Guthrie, Sanderson, & Rappaport, 2001) and a four-item measure of textures developed by the current authors were used to evaluate the convergent validity of the STEP-CHILD. The evaluation of the STEP in this study used strict psychometric criteria to determine dimensions. The original STEP subscales were also not examined for their associations with weight and diet outcome measures of clinical importance, such as body mass index percentile (BMI%), weight status (underweight, normal weight, and overweight), and diet variety (such as the percentage of foods consumed from the five food groups of proteins, dairy, starches, fruits, and vegetables) as done in this study.

Finally, the four-step process of mediational analysis offered by Baron and Kenny (1986) was used to consider the extent to which specific parent mealtime actions explained associations found between child feeding behavior problems and poor diet and weight outcome measures (BMI%, diet variety). It is believed that the new information provided by the present analyses will provide a new more child-appropriate version of the STEP measure, as well as improve understanding of how child feeding problems are associated with poor diet and weight outcomes, and how specific parent actions may help or hurt these associations. Clinicians could use these results to guide parents and children to utilizing mealtime behaviors associated with healthier outcomes.

1. Method

1.1. Participants

Participants in the present study included 142 children referred to a hospital-based feeding program (95 boys, 47 girls; mean age = 61.4 months, SD = 35.9). Diagnostic groups included children with autism ($n = 43$), children with other special needs ($n = 51$), and children with no special needs other than their feeding problems ($n = 48$). Children's height and weight were used to calculate body mass index percentile (BMI%; mean = 47.9, SD = 36.3) using the Center for Disease Control and Prevention Tables (CDCP, 2000), with 33 (27.0%) of children being underweight with BMI% less than the 10th percentile, 63 (51.6%) of children being normal weight with BMI% between the 10th and 85th percentile, and 26 (21.3%) of children being overweight with BMI% above the 85th percentile.

1.2. Measures

The Child Eating Behavior Questionnaire (CEBQ, Wardle et al., 2001) is a 35-item questionnaire that consists of eight scales; food responsiveness, enjoyment of food, desire to drink, satiety responsiveness, slowness in eating, food fussiness, slowness in eating, emotional overeating, and emotional undereating. The CEBQ was originally normed on a sample of 536 children aged 2–9 years. It was shown to have good internal consistency with Cronbach's alphas ranging from 0.72 to 0.91. It also demonstrated adequate two-week test–retest reliability and construct validity. The factor structure of the CEBQ was confirmed in a recent study involving 140 children aged 6–7 years (Sleddens, Kremers, De Vries, & Thijs, 2010).

A measure of texture consisted of four items, each item was a question concerning a specific food texture, including whether the child eats ground or lumpy food, eats cut up or chunky food, can chew dry or crisp foods, or eats regular texture meats.

Parents filled out a food preference inventory by reporting whether or not their children would eat each of 84 common foods from five food groups that included 16 proteins, 18 starches, 8 dairy, 20 fruits, and 22 vegetables. This measure has been used widely as a measure of diet variety (e.g. Paul, Williams, Riegel, & Gibbons, 2007; Schreck, Williams, & Smith, 2004).

The Parent Mealtime Action Scale (PMAS; Hendy, Williams, Camise, Eckman, & Hedemann, 2009) was developed to identify both child and parent behaviors exhibited during mealtimes as well as the frequency that the parents eat and serve

Table 1
Factor analysis results for 23 items from the original STEP adult version (Matson & Kuhn, 2001).

#Scale item	Factor loading	Cronbach's alpha	Mean	(SD)
CHEWING PROBLEMS		.60	.48	(.58)
1. Cannot independently feed	.733			
3. Does not demonstrate ability to chew	.795			
17. Swallows without chewing sufficiently	.666			
RAPID EATING		.62	.46	(.47)
11. Only eats a small amount of food presented	−.640			
12. Will continue to eat as long as food presented	.694			
15. Eats large amounts in short time	.828			
FOOD REFUSAL		.57	.87	(.54)
2. Problem behaviors increase during meals	.704			
19. Pushes food away or attempts to leave area	.670			
20. Only eats foods at certain temperature	.673			
FOOD SELECTIVITY		.66	1.53	(.68)
6. Will only eat select types of foods	.853			
23. Only eats certain textures	.789			
VOMITING		.65	.39	(.46)
18. Regurgitates or re-swallows food	.859			
21. Vomits during or right after meals	.875			
STEALING FOOD		.62	.24	(.47)
7. Steals or attempts to steal food	.897			
14. Steals of attempts to steal food outside mealtimes	.789			

ELIMINATED ITEMS:
4. Chokes on food
5. Does not demonstrate ability to swallow
8. Requires special equipment to feed
9. Attempts to eat non-food items
10. Prefers certain settings for eating
13. Spits out food before swallowing
16. Requires special positioning during feeding
22. Prefers specific feeder

certain foods (e.g. fruits and vegetables). Unlike previous parent mealtime measures, the PMAS focuses only on behavior and does not attempt to measure attitude. It was normed using three separate samples with a total of 2988 children aged 2–12 years. The PMAS is a 31-item questionnaire with nine subscales including snack limits, positive persuasion, daily fruits and vegetables availability, use of rewards, insistence on eating, snack modeling, special meals, fat reduction, and many food choices. The mean Cronbach's alpha for the nine PMAS subscales was .62 (.42–.81), while the test–retest reliability was .62 (.51–.75). Convergent validity was measured by having both the mother and father of a subset of 221 parents complete the PMAS rating and the Pearson correlation between the ratings was calculated. The mean convergent validity for the nine subscales was .69 (.59–.78). The PMAS was recently validated with a clinic sample involving 167 children referred for feeding problems (Williams, Hendy, Seiverling, & Can, in press). In this study, the original factor structure was confirmed and the PMAS demonstrated adequate internal reliability.

1.3. Procedure

Parents completed questionnaires that included the 23 items of the original STEP (Matson & Kuhn, 2001) for which they were asked to report how many times their children have displayed each feeding problem using a three-point rating (0 = not at all, 1 = one to 10 times, 2 = more than 10 times per month). In addition, parents were asked to complete the four-item measure of texture problems, the food preference inventory, the CEBQ and the PMAS. (*Note*: Although parents of all 142 children included in the present study had completed all STEP items, some parents skipped items on the measures (Listwise deletion of missing values was used in the analyses described below).

2. Results

2.1. Factor analysis

To identify underlying dimensions of the STEP when applied to the present sample of 142 feeding clinic children, factor analysis with varimax rotation was conducted for the 23 items from the original scale (Matson & Kuhn, 2001), with requirement that each dimension include at least two items, that each item show a factor loading of .40 or higher within only one dimension, and that each dimension show internal reliability of .55 or higher (*Note*: The expectation of internal reliability values of less than the traditional goal of .70 was used in the present study because of the report by the original STEP authors that the mean Cronbach's alpha for their five dimensions was only .48.). As shown in Table 1, items eliminated because they failed to meet these criteria included items 4, 16, and 22 because they had factor loadings of .40+ on more than one dimension, and items 5, 8, 9, 10, and 13 because they fell into two extra dimensions with Cronbach's alphas of .26 and .40. With these eight items removed, the factor analysis revealed six dimensions for the 15 remaining STEP items to form the

Table 2
Stepwise multiple regression to examine convergent validity of six STEP-CHILD subscales with other measures of child feeding problems.

Child feeding measurement	CHEWING PROBLEMS		RAPID EATING		FOOD REFUSAL		FOOD SELECTIVITY		VOMITING		STEALING FOOD	
	Beta	t	Beta	t	Beta	t	Beta	t	Beta	t	Beta	t
Texture problems	.445	5.16					.406	5.14				
Food responsiveness											.442	5.05
Emotional overeating			.467	6.52								
Enjoyment of food												
Desire to drink												
Satiety responsiveness			-.434	6.05								
Slowness in eating												
Emotional undereating												
Food fussiness	−.229	2.65			.296	3.18	.403	5.11			.314	3.26
	$R^2 = .216$		$R^2 = .474$		$R^2 = .088$		$R^2 = .358$		(NS)		$R^2 = .195$	
	$F_{(2, 104)} = 15.64$		$F_{(2, 104)} = 48.85$		$F_{(1, 105)} = 10.11$		$F_{(2, 104)} = 29.05$				$F_{(1, 105)} = 25.49$	
	$p = .000$		$p = .000$		$p = .002$		$p = .000$				$p = .000$	

STEP-CHILD version of the scale when applied to clinic children. More specifically, CHEWING PROBLEMS included three items with internal reliability of .60, RAPID EATING included three items with internal reliability of .62, FOOD REFUSAL included three items with internal reliability of .57, FOOD SELECTIVITY included two items with internal reliability of .66, VOMITING included two items with internal reliability of .65, and STEALING FOOD included two items with internal reliability of .62. The mean Cronbach's alpha value of internal reliability across all six STEP-CHILD subscales was .62.

The six STEP-CHILD subscales identified from our sample of feeding clinic children showed similarities to the five subscales of the original STEP measure that was developed from a sample of adults with intellectual disabilities. For example, the STEP-CHILD subscale of CHEWING PROBLEMS included items 1, 3, and 17 from the STEP subscale called "Skills." The STEP-CHILD subscale of RAPID EATING included items 11 and 12 from the STEP subscale called "Nutrition." The STEP-CHILD subscale of STEALING FOOD included items 7 and 14, which also could be found within the STEP subscale of "Nutrition." The STEP-CHILD subscale of FOOD REFUSAL included items 2 and 19 from the STEP subscale called "Refusal." The STEP-CHILD subscale of FOOD SELECTIVITY included items 6 and 23 from the STEP subscale called "Selectivity." The STEP-CHILD subscale of VOMITING included items 18 and 21 from the STEP subscale called "Aspiration Risk."

2.2. Convergent validity

To evaluate convergent validity for each of the six STEP-CHILD subscales, stepwise multiple regression analysis was used to examine whether expected associations could be demonstrated with the eight subscales of the CEBQ (Wardle et al., 2001), and a measure of texture problems. In each multiple regression, the STEP-CHILD subscale score (calculated as the mean three-point rating, with reverse ratings used for any items with a negative factor loading), served as the criterion variable and the other measures of children's feeding problems served as the predictor variables. For the CEBQ, the subscale scores were calculated as the mean rating given by parents for items within that subscale. The texture problems score was the number of the four textures which children exhibited problems eating. (*Note*: Because of the large number of multiple regression analyses and analyses of variance used with the STEP-CHILD subscales in the present report, we used a conservative requirement of $p < .02$ in these analyses, rather than the traditional $p < .05$, to reduce our study-wise risk of Type I errors.)

In Table 2, the relations between the STEP-CHILD subscales and other feeding measures are shown. As would be expected if the STEP-CHILD subscales were validly measuring the underlying variables described by their names, the subscale called CHEWING PROBLEMS was positively correlated with texture problems ($p = .000$) and food fussiness. The subscale of RAPID EATING was positively correlated with the CEBQ's Emotional Overeating ($p = .000$) and negatively correlated with the CEBQ's Satiety Responsiveness ($p = .000$). The subscale of FOOD REFUSAL was positively correlated with the CEBQ's Food Fussiness ($p = .000$). The subscale of FOOD SELECTIVITY was positively correlated with both the Texture Problems measure ($p = .000$) and the CEBQ's Food Fussiness ($p = .000$). The subscale of STEALING FOOD was positively correlated with both the CEBQ's Food Responsiveness ($p = .000$) and Food Fussiness ($p = .000$).

2.3. Child demographic variables associated with STEP-CHILD feeding problems

To examine how child demographic variables were associated with each of the six STEP-CHILD subscale scores for the 142 participants (again calculated as the mean rating for items included within the subscale, reversing ratings for negatively loaded items), we used 2 × 3 analyses of covariance with two genders (boys, girls) and three diagnostic groups (autism, other special needs, no special needs) serving as between-subjects variables, and with age in months as a covariate. Results displayed in Table 3 indicated that CHEWING PROBLEMS were significantly associated with age ($p = .004$), with the youngest children having the most problems ($r = -.222$, $n = 142$, $p = .008$). STEALING FOOD was significantly associated with diagnostic groups ($p = .012$), with paired comparisons revealing that children with autism displayed more problems than did children with other special needs or children with no special needs ($t_{(92)} = 3.14$, $p = .002$; $t_{(89)} = 3.84$, $p = .000$; respectively).

Table 3
Analyses of covariance to examine how child demographic variables were associated with each of six STEP-CHILD subscale scores (significant findings in bold).

Effect	CHEWING PROBLEMS			RAPID EATING			FOOD REFUSAL		
	$F_{(df)}$	p	Effect size	$F_{(df)}$	p	Effect size	$F_{(df)}$	p	Effect size
Age	**$8.64_{(1, 135)}$**	**.004**	**.060**	$4.03_{(1, 135)}$	.047	–	$1.02_{(1, 135)}$	.314	–
Gender	$1.19_{(1, 135)}$	.277	–	$3.12_{(1, 135)}$	.080	–	$.03_{(1, 135)}$	.855	–
Diagnosis	$2.06_{(2, 135)}$	.132	–	$.91_{(2, 135)}$	.407	–	$3.20_{(2, 135)}$	.044	–
Gender × Diagnosis	$.48_{(2, 135)}$	.618	–	$.84_{(2, 135)}$	.434	–	$.63_{(2, 135)}$	.534	–
Effect	**FOOD SELECTIVITY**			**VOMITING**			**STEALING FOOD**		
	$F_{(df)}$	p	Effect size	$F_{(df)}$	p	Effect size	$F_{(df)}$	p	Effect size
Age	$1.12_{(1, 135)}$	.292	–	$1.27_{(1, 135)}$	.262	–	$.00_{(1, 135)}$	.998	–
Gender	$3.75_{(1, 135)}$	.055	–	$.37_{(1, 135)}$	.545	–	$.01_{(1, 135)}$	.941	–
Diagnosis	$.39_{(2, 135)}$	.679	–	$.88_{(2, 135)}$	.418	–	**$4.58_{(2, 135)}$**	**.012**	**.064**
Gender × Diagnosis	$.58_{(2, 135)}$	.560	–	$1.12_{(2, 135)}$	.328	–	$.76_{(2, 135)}$	.471	–

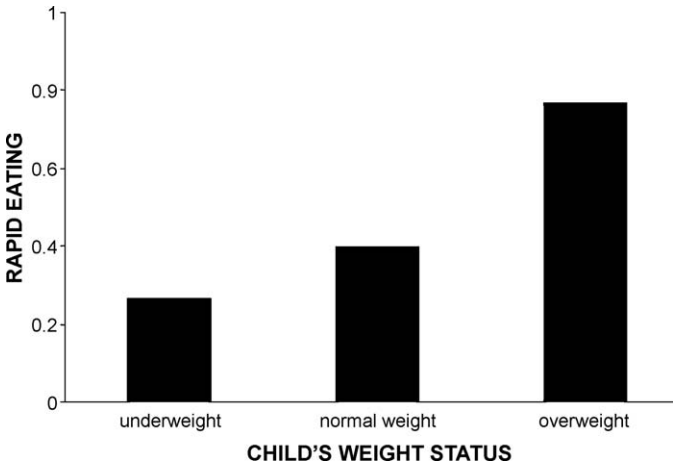

Fig. 1. Mean ratings for the items on the RAPID EATING subscale and child weight status.

2.4. Associations between STEP-CHILD and diet and weight outcomes

To examine whether the STEP-CHILD feeding problems were associated with measures of children's weight, a stepwise multiple regression analysis was conducted with children's weight defined as their BMI% score serving as the criterion variable, and with the six STEP-CHILD subscale scores serving as predictor variables. Results revealed that only RAPID EATING was significantly associated with higher BMI% scores (beta = .336, $F_{(1,\ 122)} = 15.52$, $p = .000$; $R^2 = .113$). Also, to consider how the six STEP-CHILD feeding problems were associated with the three categories of children's weight status (underweight = BMI% less than 10th, normal weight = BMI% between 10th and 85th, overweight = BMI% above 85th), a multivariate analysis of variance was conducted in which the six STEP-CHILD subscale scores were the multiple dependent variables, and with the three weight status categories serving as the between-subjects independent variable. As before, only RAPID EATING was significantly associated with children's weight status ($F_{(2,\ 119)} = 9.64$, $p = .000$, partial Eta^2 effect size = .139). Paired comparisons revealed that overweight children displayed significantly more RAPID EATING than did the normal weight children or the underweight children ($t_{(87)} = 3.34$, $p = .001$; $t_{(57)} = 4.04$, $p = .000$; respectively) is displayed in Fig. 1.

To examine whether the STEP-CHILD feeding problems were associated with diet variety, a stepwise multiple regression was used with the number of 84 common foods eaten serving as the criterion variable, and with the six STEP-CHILD subscale scores serving as predictor variables. Results revealed that, as might be expected, only the child feeding problem of FOOD SELECTIVITY was significantly associated with reduced diet variety eaten (beta = −.614, $F_{(1,\ 139)} = 84.31$, $p = .000$; $R^2 = .378$).

2.5. Parent mealtime actions associated with STEP-CHILD

To examine parent mealtime actions associated with the STEP-CHILD feeding problems, stepwise multiple regression analyses were again used with each of the six STEP-CHILD subscale scores serving as criterion variables, with the nine subscale scores from the Parent Mealtime Action Scale (PMAS, Hendy et al., 2009) serving as the predictor variables. Results revealed that children with more CHEWING PROBLEMS had parents who rarely set Snack Limits (beta = −.317, $F_{(1,\ 86)} = 9.58$, $p = .003$; $R^2 = .100$). Children with more RAPID EATING had parents who rarely used Insistence on Eating during meals (beta = −.302, $F_{(1,\ 86)} = 8.65$, $p = .004$; $R^2 = .091$). Children with more FOOD SELECTIVITY had parents who often prepared them Special Meals different than the shared family meal, and who often gave them Many Food Choices of whatever foods they wanted (beta = .296, beta = .263, respectively; $F_{(2,\ 86)} = 9.25$, $p = .000$; $R^2 = .179$).

2.6. Do parents contribute to associations between feeding problems and poor weight and diet outcomes?

Because the above results revealed that the child feeding problem of RAPID EATING was significantly associated with both higher BMI% scores and the parent action of rarely using Insistence on Eating during meals, the parent's Insistence on Eating may be a mediating variable that explained some of the association between children's RAPID EATING and heavier BMI%. Also, because the child feeding problem of FOOD SELECTIVITY was significantly associated with both reduced diet variety (defined as the number of 84 foods eaten) and the parent action of preparing Special Meals different than the family meal, the parents Special Meals may be a mediating variable that explains some of the association between children's FOOD SELECTIVITY and poor diet variety outcome. To examine whether these specific parent mealtime actions served as mediating variables in this way, we used the four-step mediation analysis of Baron and Kenny (1986): (1) document a correlation between the child feeding problem and the weight or diet outcome; (2) document a correlation between the child feeding problem and the parent mealtime action; (3) document a correlation between the parent mealtime action and the weight or

Table 4
The four steps of mediation analysis to evaluate parent mealtime actions as mediating variables to explain the associations between children's feeding problems and poor weight and diet variety outcomes.

Step (A)	Correlation examined	*r*	*p*	R^2 change
(1)	RAPID EATING and BMI%	.336	.000	.113
(2)	RAPID EATING and Insistence on Eating	−.252	.004	
(3)	Insistence on eating and BMI%	−.211	.025	
(4)	RAPID EATING and BMI% (first partialling out Insistence on Eating)	.278	.003	.074
Step (B)	Correlation examined	*r*	*p*	R^2 change
(1)	FOOD SELECTIVITY and diet variety	−.614	.000	.378
(2)	FOOD SELECTIVITY and Special Meals	.363	.000	
(3)	Special Meals and diet variety	−.456	.000	
(4)	FOOD SELECTIVITY and diet variety (first partialling out Special Meals)	−.542	.000	.233

diet outcome; and (4) if all three of the above correlations are significant, determine if the R^2 change (the percentage of variance explained) by the child feeding problem for the outcome measure is reduced substantially when the parent mealtime action is partialled out first. The results of this mediation analysis are shown in Table 4.

For the association found between children's RAPID EATING and heavier BMI% scores, steps 1 through 3 of the mediation analysis documented the significant correlations required, and step 4 documented that the percentage of variance for BMI% explained by children's RAPID EATING (the R^2 change value) was reduced from .113 to .074 (a drop of 34.5%) when parent's Insistence on Eating during meals was partialled out first. These results revealed that over 1/3 of the association between children's RAPID EATING and heavier BMI% scores was explained by the parent's infrequent use of Insistence on Eating during meals. Similarly, for the association found between children's FOOD SELECTIVITY and their poor diet variety, steps 1 through 3 of the mediation analysis documented the significant correlations required, and step 4 documented that the percentage of variance explained for diet variety by children's FOOD SELECTIVITY was reduced from .378 to .233 (a drop of 38.4%) when parent's use of Special Meals was partialled out first. These results revealed that over 1/3 of the association between children's FOOD SELECTIVITY and their poor diet variety was explained by the parent's frequent preparation of Special Meals for their children different from the shared family meal.

3. Discussion

The present study evaluated the psychometric characteristics of the 23-item and five-subscale adult version of the Screening Tool for Feeding Problems (STEP, Matson & Kuhn, 2001) when applied to a sample of feeding clinic children, and when using stricter psychometric criteria than in the original study. The result was a more psychometrically-sound and parsimonious 15-item and six-subscale version we call the STEP-CHILD: CHEWING PROBLEMS (three items), RAPID EATING (three items), FOOD REFUSAL (three items), FOOD SELECTIVITY (two items), VOMITING (two items), and STEALING FOOD (two items). The six subscales showed a mean internal reliability of .62 (in comparison to the .48 mean Cronbach's alpha for the adult version), with convergent validity demonstrated by expected associations with another psychometrically tested measure of child feeding problems, the CEBQ (Wardle et al., 2001), as well as a four-item measure of texture problems. This version provides the advantage of being developed using children specifically referred for feeding problems which allowed for the identification of more specific dimensions of feeding problems.

The results of this study showed both child and parent variables were significantly associated with a child's increased risk for feeding problems. Several of these results are new to the literature. For example, CHEWING PROBLEMS were more common in the youngest children, and with children whose parents rarely set Snack Limits. While more problems with texture and chewing would be expected in younger children as the development of oral motor skills occurs across the course of development, the relation between chewing problems and parents' failure to set limits on snacks has not yet been reported in the literature. It is possible that children who are permitted to eat whatever they wish may eat less table food during meals and thus have more difficulty eating these foods. STEALING FOOD was most common in children with autism. Although food stealing has been explored in adults with special needs and in specific populations, such as persons with Pader Willi syndrome, no studies to date have examined the prevalence of food stealing in various subgroups of children with feeding problems. RAPID EATING was associated with increased risk for children being overweight, and with parents rarely using Insistence on Eating during meals. One of these findings was supported by previous research. Although research has not previously examined the relation between rapid eating and the parent behavior of insistence on eating, some previous research may be relevant. In a recent study, rapid eating as measured by bites per minute was found to be a strong predictor of weight gain in children (Berkowitz et al., 2010). On measures similar to the Insistence to Eat measure in the STEP-CHILD, such as the Children's Feeding Questionnaire's Pressure to Eat scale (Birch et al., 2001) and the Pediatric Feeding Questionniare's Pushing the Child to Eat More scale (Baughcum et al., 2001), *higher* scores were related to *lower* BMI-*z* scores (Carnell & Wardle, 2007).

As an increased pressure or insistence on eating is related to lower BMI-*z* scores, it is possible that parents who do not insist that their children eat during mealtimes are not just refraining from pressuring or insisting their children eat any food but also do not pressure their children to eat healthier foods (e.g. vegetables) or a greater food variety which may reduce the

rate of eating as the children may be more reluctant to eat these other foods. FOOD SELECTIVITY was associated with children eating less diet variety as measured by the food preference inventory, and with parents often preparing Special Meals for their children that were different than the shared family meal. Mediation analysis revealed that "overly permissive" actions by parents (such as infrequent Insistence on Eating during meals, or frequent preparation of Special Meals for children different than the family meal) explained over 38% of the associations found between children's feeding problems and their BMI% and diet variety scores. These findings regarding Food Selectivity replicated results of previous work which also found that the Special Meals measure of the PMAS was related to a more narrow diet variety (Hendy, Williams, Riegel, & Paul, 2010). This study hypothesized that by providing children with special meals rather than the family meal or school lunch that the children were not exposed to the range of foods typically offered at meals and thus no opportunities were provided for the repeated taste exposures required to develop preferences for novel foods (Cooke, 2007). There is very little work to date which has examined the relation between children's feeding behavior and their parents' mealtime behavior, especially in clinical populations. Further, the STEP-CHILD would be especially useful in measuring children's feeding behavior, especially since it measures behavioral dimensions such as FOOD STEALING not widely included in other questionnaires.

Results of the present study may also help clinicians identify children at greatest risk for the feeding problems measured by the STEP-CHILD. In addition, the present results documenting that specific parent mealtime actions contribute to the poor weight and diet outcomes often experienced by children with feeding problems may encourage parents to seek other responses to their children's feeding problems. For example, rather than "giving up" and becoming "overly permissive" by no longer expecting their children to try small amounts of foods presented during the family meal and by preparing their children a Special Meal of their favorite foods, parents may want to insist that their children eat at least small amounts during the family meal even if the child is emotionally upset or says that he or she is tired or not hungry. Parents may also want to refrain from preparing special meals. If a child learns that he or she does not have to eat the foods presented during dinner and that parents will provide preferred foods contingent on refusal to eat new or non-preferred foods, then these children may be at greater risk for feeding problems as well as poor weight and diet variety.

In previous research, the STEP has been used exclusively with adults with special needs. This study suggests that a version of the STEP, the STEP-CHILD, could be a useful measure for assessment of feeding problems in children. To date, there are few psychometrically validated measures of childhood feeding problems. The STEP-CHILD measures a range of feeding problems, including some areas such as rapid eating that are not included in other measures assessing feeding problems. Future research could involve samples of children with and without special needs not referred for feeding problems to determine the prevalence of these issues in non-clinical samples.

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