

Executive Function, Eating Competence, and the Feeding Relationship in Parents of
Preschool-Aged Children

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A thesis
submitted in partial fulfillment of the
requirements for the degree of

Master of Science

University of Washington

2025

Committee:

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Program Authorized to Offer Degree:

Nutritional Sciences

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Abstract

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Importance: The Satter Division of Responsibility in Feeding (sDOR) is a commonly-used feeding framework to establish healthy eating and feeding relationships in preschool-aged children. Eating competence is positively associated with adherence to the sDOR. Both eating competence and adherence to the sDOR require executive functioning skills but little is known about the relationship between executive functioning, eating competence, and adherence to the sDOR.

Objective: The primary aim of this study is to test whether parental executive function is related to eating competence and/or adherence to the sDOR.

Methods: In this cross-sectional study, 40 participants completed the Barkley Deficits in Executive Functioning Scale (BDEFS), Satter Eating Competence Inventory (ecSI 2.0™), Satter Division of Responsibility in Feeding Inventory for 2- to 6-year-olds (sDOR.2-6y™), the 10-Item Perceived Stress Scale (PSS-10), and completed short answer questions about the family meal experience. Correlations between survey totals were calculated using Spearman's rank correlation coefficient. Qualitative themes were compiled from short-answer responses.

Results: There was a moderate negative correlation between aggregate BDEFS scores and aggregate ecSI 2.0™ scores ($r_s = -0.488$, $p\text{-value} = 0.001$), a strong correlation between aggregate BDEFS scores and aggregate PSS-10 scores ($r_s = 0.816$, $p\text{-value} < 0.001$), and a moderate negative correlation between aggregate sDOR.2-6y™ scores and aggregate PSS-10 scores ($r_s = -0.468$, $p\text{-value} = 0.003$).

Conclusions: While we were able to show a relationship between executive function and eating competence, further research is necessary to ascertain if there is a relationship between executive function and adherence to the sDOR because our sample did not contain enough variety in executive functioning abilities to draw any conclusions about this relationship.

1. Background and Significance:

Eating habits established during the preschool years (2 to 5 years old) can persist into later childhood, adolescence, and even adulthood.^{1,2} Caregivers of preschool-aged children can affect their child's eating relationship through modeling, parenting around food, and establishing the food environment for the home.¹ At the same time, preschool-aged children are establishing more independence and autonomy in food choice and parents of preschool-aged children often worry that their child is not eating enough, enough of certain types of foods, or eating too much, which can lead parents to adopt non-responsive feeding practices like restricting foods, pressuring to eat, and rewarding with food.³ These practices are more common in parents of children who are perceived to be over- or underweight.³ Non-responsive feeding practices have been associated with increased picky eating behavior over the course of preschool years, extreme weight control behaviors in adolescence, and higher intake of sweets and snack foods in adulthood.^{2,4,5}

The Satter Division of Responsibility in Feeding (sDOR) is a popular feeding model widely used for providing guidance on parental modeling, parenting around food, and establishment of a food environment, without the use of controlling feeding behaviors.⁶ The sDOR focuses around the concept that the roles of the caregiver and child in the feeding relationship are separate and distinct: the caregiver is responsible for providing leadership on what, when, and where foods are provided, while providing children with the autonomy to choose whether and how much food to eat.⁷ A major strength of the sDOR is that its focus on the parent's role in the feeding relationship allows parents and health care providers to address issues with child eating without directly intervening in—and disrupting—child eating behaviors.⁶ Another strength of the sDOR is its adaptability—since the sDOR focuses on the feeding relationship instead of what foods are offered, parents and health care providers can address eating behaviors with foods that are available and relevant to the family.⁶ Parents following the sDOR framework are less likely to engage in food restriction and pressure to eat and also report lower stress levels than parents with low adherence to the sDOR.⁸

One of the goals of the sDOR is to raise children who are competent with eating and feeding themselves. Eating competence is an inclusive model emphasizing a person's comfort and flexibility around food and eating. Eating competence, as measured by the Satter Eating Competence Inventory (ecSI 2.0™), is positively correlated with the Satter Division of Responsibility in Feeding Inventory for 2- to 6-year-olds (sDOR.2-6y™), a measure of parental adherence to the sDOR.^{8,9} Parental eating competence is associated with increased modeling of health-promoting behaviors separate from adherence to the sDOR^{10,11} and is associated with lower nutritional risk in children.⁶ One

of the four domains of eating competence is contextual skills around planning and structuring meals, among other skills.⁹

Contextual skills require executive function skills, which are the mental processes that require a person to concentrate and pay attention to a task that commonly fall into three core functions: inhibitory control, working memory, and cognitive flexibility.¹² Inhibitory control is the ability to control focus, actions, emotions, and thoughts.¹² Inhibitory control is what individuals use to focus on one conversation in a busy room, stay calm instead of reacting emotionally, and continue working on an important, but dull, task with no immediate reward.¹² Working memory is the ability to mentally hold and manipulate information once it is no longer physically present.¹² Working memory allows individuals to connect unrelated ideas and mentally break down and recombine complex concepts. Cognitive flexibility is the ability to “change one’s mind” and allows individuals to adjust their thoughts and behaviors to changing demands, shift between tasks, and consider the perspective of others.¹² Some functions, like planning and problem solving, require a combination of several core executive functions and are considered higher-order executive functions.^{12,13}

Executive functions are negatively affected by stress, lack of sleep, sadness, and loneliness, which are commonly experienced by parents of young children.^{12–14} Executive dysfunction is key feature of attention deficit hyperactivity disorder (ADHD)¹⁵ and executive function may be diminished in individuals with anxiety, depression, or autism spectrum disorder.^{13,16} Parents experiencing more of these challenges can experience even greater reductions in executive functioning.¹³

Parents feeding their children may need to utilize executive functions to consider their long-term goals before acting, respond to unanticipated challenges, resist the temptation to give in to their child’s demands, and control their own behaviors and emotions at the dinner table.¹² Executive functions may also be required when individuals plan meals, decide which foods to eat, monitor adherence to dietary recommendations, grocery shop, and prepare foods.¹⁷

The sDOR is a popular and well-supported framework for parents to use when feeding their preschool-aged children but we have little information about its relationship with parental executive functioning. Recent research on maternal executive function and feeding practices suggests mothers with executive functioning difficulties may be more likely to engage in non-responsive feeding behaviors, such as using food to soothe, less likely to follow a mealtime schedule, and less likely to have family meals.^{18,19} Difficulties with executive function have also been linked to increased controlling feeding behaviors.²⁰ And while higher levels of maternal stress have been associated with higher levels of controlling feeding behaviors, such as pressuring a child to eat certain foods or restricting a child’s diet, mothers with better executive functioning abilities who

were exposed to high-stress conditions were less likely to engage in these behaviors than mothers with low executive functioning.²⁰ While better executive function has been linked to health-promoting eating behaviors,^{21,22} the research on the relationship between executive function and eating competence is extremely limited.²³

The primary goal of this research is to explore the relationships between parental executive functioning, eating competence, and the ability to feed children utilizing the sDOR among parents of preschool-aged children, and whether higher perceived stress levels are related to those relationships.

The primary aim of this study is to test whether parental executive function is related to ecSI 2.0™ and/or the sDOR.2-6y™.

The secondary aims of this study are to explore:

- 1) whether perceived stress is also related to parental executive functioning, parental eating competence, and the ability to feed children utilizing the sDOR;*
- 2) how caregivers perceive their family mealtimes; and*
- 3) whether themes related to eating competence, executive function, and the sDOR emerge from caregivers' descriptions of what works well and what they wish to do differently when feeding their families.*

This research is important because the role of executive function in eating competence and feeding ability has been understudied in parents of preschool-aged children.

2. Methods:

Study Design:

This was a cross-sectional study based on anonymous surveys conducted during early fall 2024. Exempt status from full IRB review was granted by the University of Washington's (UW) Human Subjects Division.

Participants:

Participants were recruited through the UW parenting listserv. Preschools were also contacted and provided with recruitment flyers to display at locations and/or send out in parent newsletters, but these efforts did not result in any additional participants. Individuals were eligible to participate in the study if they were between 18 and 64 years of age, the parent/primary caregiver of at least one child between the ages of 2 and 5, one of the people primarily responsible for feeding the preschool-aged child, and able to understand and complete the survey materials that were written in English.

Data Collection and Instruments:

Data collection:

Links to the survey were provided to participants via emails through the UW parenting listserv. Study data was collected and managed using REDCap electronic data capture tools hosted at the Institute of Translational Health Sciences.^{24,25} REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources. On the landing page of the survey, respondents acknowledged their consent to participate in the study and confirmed their eligibility by affirming that they met the inclusion criteria.

Questionnaires:

The study questionnaires included demographic information, the Barkley Deficits in Executive Functioning Scale (BDEFS), ecSI 2.0TM, sDOR.2-6yTM, the 10-Item Perceived Stress Scale (PSS-10), and three open-ended questions.

Demographics:

The demographic data collected include age, gender identity, partnership status, income bracket, employment status, race/country of origin, number of adults living in home, number/age range of children living in home, participants' role as caretaker for other

members of the household. Additionally, participants were asked about their role in feeding their preschooler and the following questions:

- In an average 7-day week, how many meals does preschool-aged child eat at home;
- In an average 7-day week, how many meals are eaten with preschool-aged child;
- In an average 7-day week, how many meals does participant cook/prepare for preschool-aged child;
- A short-answer question: “What values and traditions influence how you feed your child?”

Executive function:

The BDEFS was used to assess parental/primary caregiver executive functioning.²⁶ The BDEFS includes 89 questions encompassing the following domains: (1) self-management of time; (2) self-organization/problem-solving; (3) self-restraint; (4) self-motivation; and (5) self-regulation of emotions.²⁶ All questions are scored on a 4-point Likert scale based on the following responses and their associated point values: “never or rarely” (1); “sometimes” (2); “often” (3); and “very often” (4).²⁶ Aggregate and domain-specific scores were totalled.²⁶ Total possible aggregate scores for the BDEFS are between 89 to 365 and possible domain-specific scores are: (1) self-management of time: 21 and 84; (2) self-organization/problem-solving: 24 and 96; (3) self-restraint: 19 and 76; (4) self-motivation: 12 and 48; and (5) self-regulation of emotions: 13 and 52.²⁶

Aggregate scores for the BDEFS were then used to find a percentile value based on the age of the participant. Percentiles were then associated with the degree of executive function deficiency an individual is likely to have:

- <75th percentile: little deficiency;
- 76th and 84th percentile: marginal clinical significance;
- 85th and 92nd percentile: borderline or somewhat significant deficiency;
- 93rd and 95th percentile: mild deficiency;
- 96th and 98th percentile: moderate deficiency;
- 99th percentile: severe deficiency.²⁶

Eating Competence

The validated ecSI 2.0TM was used to assess parental/primary caregiver eating competence.²⁷ The ecSI 2.0TM includes 16 questions covering domains for eating attitudes, internal regulation, food acceptance, and contextual skills.²⁷ All questions are scored on a 5-point Likert scale based on the following responses and associated point values: “Always” (3); “Often” (2); “Sometimes” (1); “Rarely” (0); and “Never” (0). Total possible aggregate scores for the ecSI 2.0TM are between 0 and 48 with total scores greater than or equal to 32 considered eating competent.²⁸ Aggregate scores were

totalled and assigned to either “eating competent” (scores 32-48) or “not eating competent” categories (scores 0-31).

Adherence to sDOR:

The validated sDOR.2-6yTM was used to assess parental/primary caregiver adherence to the sDOR.⁸ The sDOR.2-6yTM includes 12 questions related to two subscales of parental leadership with feeding (mealtime structure with timing and location (when and where) and what food is available to the child) and child autonomy with eating (parent gives respect to child autonomy in eating and control of what, whether, and how much is eaten).⁸ All questions are scored on a 5-point Likert scale, based on the following responses and associated point values: “Always” (3); “Often” (2); “Sometimes” (1); “Rarely” (0); and “Never” (0); or the reverse: “Always” (0); “Often” (1); “Sometimes” (2); “Rarely” (3); and “Never” (3), depending on the question. Total aggregate scores for the sDOR.2-6yTM are between 0 and 36 with scores greater than or equal to 24 considered to have good adherence to the sDOR.⁸ Aggregate scores were totalled and assigned to “high adherence to sDOR” (scores between 24 and 36) or “low adherence to sDOR” (scores between 0 and 23).⁸

Perceived Stress Scale:

The PSS-10 was used to assess parental/primary caregiver perceived stress.²⁹ The PSS-10 includes 10 questions scored on a 5-point Likert scale based on the following responses and their point values: “Never” (0); “Almost Never” (1); “Sometimes” (2); “Fairly Often” (3); and “Very Often” (4), or “Very Often” (0); “Fairly Often” (3); “Sometimes” (2); “Almost Never” (3); and “Never” (0), depending on the question.²⁹ Aggregate scores were totalled. Total scores for the PSS-10 are between 0 and 40, continuous scale.²⁹

Additional questions:

Three optional, open-ended questions were included after the surveys: 1) “How would you describe your family mealtimes?”, 2) “What things work well when feeding your family?”, and 3) “What do you wish you could do differently when feeding your family?”

Data Analysis:

Quantitative data:

Excel was used to analyze the quantitative data in this study. Descriptive statistics were used to summarize demographic characteristics and study variables: means and standard deviation for continuous variables; and frequencies and proportions for categorical variables. Initial analysis showed skewness in aggregate BDEFS, ecSI 2.0TM, sDOR.2-6yTM, and PSS-10 scores so Spearman’s correlation coefficient was used to evaluate whether there are relationships between executive functioning,

eating competence, and adherence to the sDOR by comparing aggregate BDEFS scores and aggregate sDOR.2-6yTM scores, aggregate BDEFS scores and aggregate ecSI 2.0TM scores, and aggregate ecSI 2.0TM scores and aggregate sDOR.2-6yTM scores. To evaluate whether there was a relationship between perceived stress levels and executive functioning, eating competence, or adherence to the sDOR, aggregate BDEFS, sDOR.2-6yTM and ecSI 2.0TM scores were each compared with aggregate PSS-10 scores. A significance level of .05 was used for all tests.

Qualitative data:

Coding Strategy:

The coding strategy for this study was a hybrid approach combining deductive and inductive coding including pre-defined codes based on elements of eating competence, executive function, and the sDOR and allowance for emergent codes based on participant responses.

Code Development Process:

The primary investigator developed the initial codebook combining deductive codes based on elements of eating competence, executive function, and the sDOR, and inductive codes based on participant responses with ongoing input from research mentors (C.H. and M.A.) throughout the development process. Initially, the codebooks for each open-ended question were distinct, but as the codebooks were developed it became clear that “How would you describe your family mealtimes?” and “What things work well when feeding your family?” utilized similar codes. Codes for “What do you wish you could do differently when feeding your family?” were distinct from the other questions and thus retained a separate codebook.

Two secondary researchers independently applied codes to the dataset. The coded responses were then compared and the most frequently used code for a segment of text was used. Team meetings were held to discuss the findings, refine code descriptions, and discuss appropriate codes for segments of text where there was no consensus between coders.

Final codes applied to the responses to “How would you describe your family mealtimes?” and “What things work well when feeding your family?” were compared to initial codes based on elements of the sDOR and categorized based on alignment with parental adherence to the sDOR. Codes were considered in alignment with parental adherence to the sDOR if the behavior is part of the framework of the sDOR and within the participants’ ability to control. Codes were considered out of

alignment with parental adherence to the sDOR if the behavior is in direct opposition to the framework of the sDOR and within the participants' ability to control. Codes were neutrally aligned with parental adherence to the sDOR if the behavior is an element not directly covered by the sDOR framework, not clearly in or out of alignment with the sDOR, or not within the participants' ability to control. Research mentors provided final guidance on which codes to include in alignment categories based on their expertise in the sDOR.

Validation Approach:

A multi-coder process was used to enhance reliability and incorporate diverse perspectives on data interpretation.

Reflexivity/positionality:

The primary researcher and research mentors are parents with children at different life stages who have experience with parenting and feeding preschool-aged children. These experiences were used when discussing code applications during the study, particularly when there was a misalignment between the secondary researchers (who were not parents) and the primary researcher.

Analysis Framework:

Thematic analysis was utilized in this study to identify patterns in the parental feeding experience. Codes were organized into overarching themes. Themes related to "How would you describe your family mealtimes?" and "What things work well when feeding your family?" can be found in Figure 1. Since the question "What do you wish you could do differently when feeding your family?" was a change in tone from the other short-answer questions—essentially asking parents to envision an ideal meal time and what it would take to achieve that as opposed to asking about the reality of their situation—the initial codes and the resulting themes were distinct from the themes found in the other two open-ended questions. Themes present in responses to "What do you wish you could do differently when feeding your family?" can be found in Figure 2.

Figure 1: Code Tree for Responses to "How would you describe your family mealtimes?" and "What things work well when feeding your family?"

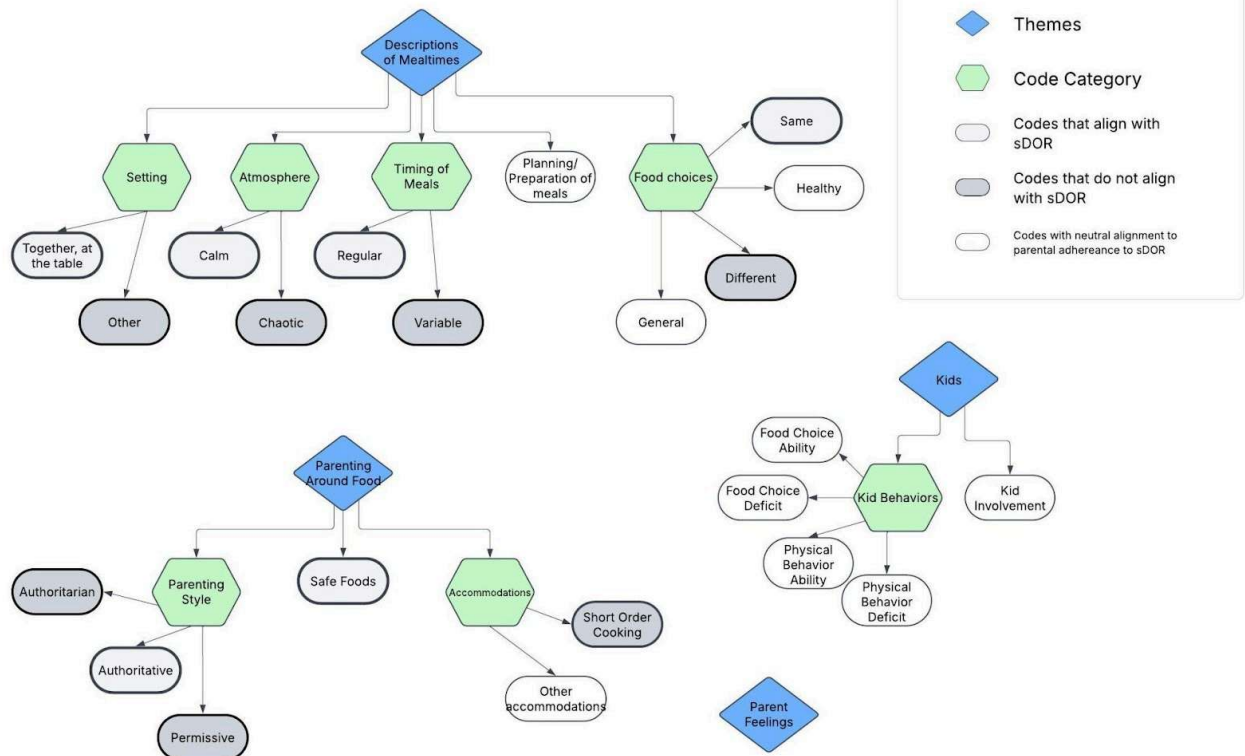
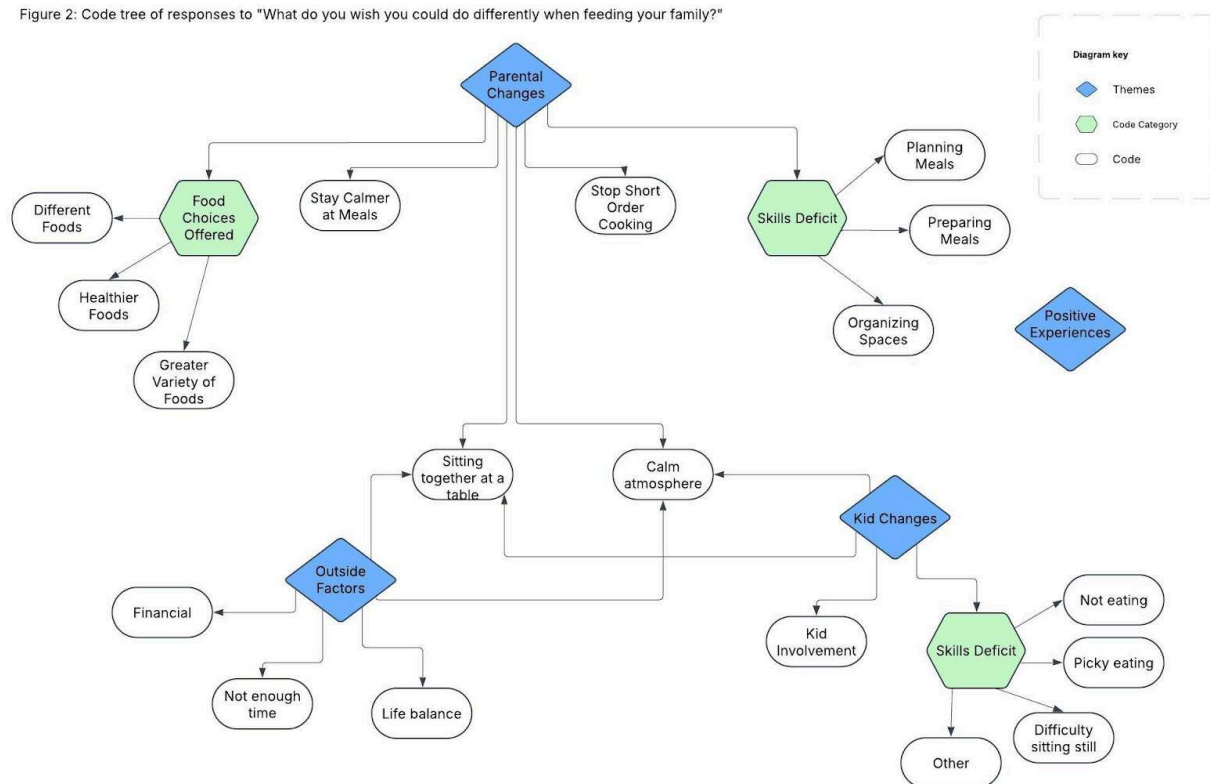


Figure 2: Code tree of responses to "What do you wish you could do differently when feeding your family?"



3. Results:

3.1. Responses

Fifty-nine individuals clicked the link for the study materials. Of those, 5 did not consent to the study, 4 did not meet study criteria, 3 met study criteria but did not complete demographic data, and 7 completed demographic data but did not complete the BDEFS. Because the aim of this study was to examine the relationships between executive function, ecSI 2.0™ and the sDOR.2-6y™, participants who did not complete the BDEFS, ecSI 2.0™ and the sDOR.2-6y™ were not included in the study.

Forty participants completed demographic information, BDEFS, ecSI 2.0™, and sDOR.2-6y™ surveys and thirty-nine completed the PSS-10. Demographics, role in feeding preschoolers, BDEFS, ecSI 2.0™ and the sDOR.2-6y™ scores are reported for the 40 participants who completed these portions of the survey. PSS-10 scores are reported for the 39 participants who completed the PSS-10.

Thirty-eight participants engaged with the open-ended question: “How would you describe your family mealtimes?” and thirty-seven participants responded to “What things work well when feeding your family?” and “What do you wish you could do differently when feeding your family?” offering additional information about the experience of feeding their families.

3.2. Demographics:

Participants were predominantly female (90%), married (90%), employed full-time (72.5%), have high-income households (72.5% earn \$150,000 or more per year), and are White (72.5%). The average household size for participants was 3.5 (SD = 0.64), with an average of 1.95 adults per household (SD = 0.22) and an average of 1.58 children per household (SD = 0.54). Demographic data are summarized in Table 1.

Table 1 - Demographics

Demographic data	Mean (standard deviation)
Age	
Age of Participants	37.48 (3.3)
Household Size	
Average Household Size	3.5 (0.64)
Average Number of Adults in Household	1.95 (0.22)
Average Number of Children in Household	1.58 (0.54)

Table 1 - Demographics

Demographic data	n (%)
Gender	
Male	4 (10)
Female	36 (90)
Marital Status	
Married	36 (90)
Single or never married	2 (5)
Divorced	1 (2.5)
Living with partner	1 (2.5)
Employment	
Unemployed	1 (2.5)
Work part-time	5 (12.5)
Work full-time	29 (72.5)
Full time student	3 (7.5)
Part time student	1 (2.5)
Multiple part-time jobs	1 (2.5)
Stay-at-home parent/caregiver	0 (0.0)
Household Income	
Under \$10,000	1 (2.5)
\$10,000 to \$14,999	0 (0.0)
\$15,000 to \$24,999	0 (0.0)
\$25,000 to \$34,999	1 (2.5)
\$35,000 to \$49,999	0 (0.0)
\$50,000 to \$74,999	1 (2.5)
\$75,000 to \$99,999	0 (0.0)

Table 1 - Demographics

Household Income - continued	
\$100,000 to \$149,999	7 (17.5)
\$150,000 to \$199,999	8 (20.0)
\$200,000 or more	21 (52.5)
Prefer not to answer	1 (2.5)
Race or Origin	
African American or Black	0 (0.0)
Western Asian	0 (0.0)
Southeast Asia	1 (2.5)
South Asian	1 (2.5)
East Asian	2 (5.0)
Central Asian	0 (0.0)
Latinx, or Spanish origin	1 (2.5)
American Indian or Alaska Native	0 (0.0)
Native Hawaiian or Other Pacific Islander	0 (0.0)
White or Caucasian	29 (72.5)
More than one race or origin	6 (15.0)
Provide care for anyone in household besides child/children?	
Yes	2 (5.0)
No	38 (95.0)

3.3. Role in feeding preschoolers:

Participants' role in feeding their preschoolers is summarized in Table 2. Nearly half of participants (47.5%) reported that they were responsible for 50-70% of feeding responsibilities. In a typical 7-day week, a majority of participants (75%) reported that their preschool-aged child consumed only one meal outside of the home, almost half

(47.5%) of participants eat two meals a day with their preschool-aged child, and over half (52.5%) of participants cook/prepare two meals a day for their preschool-aged child.

Participants were also asked to answer the question: “Please specify your role in feeding your preschool-aged child (e.g., purchasing food, planning meals/snacks, preparing food).” Responses to this question commonly fell under the themes of planning (making grocery lists, planning menus, etc.), acquiring (going grocery shopping, ordering grocery delivery, etc.) and preparing (cooking or otherwise putting together meals and snacks). Participants also described the role of their partner and their childcare centers in feeding their preschool-aged children.

Table 2 - Role in Feeding

Question	n (%)
Role in feeding preschool-aged child	
90-100%	4 (10.0)
70-90%	10 (25.0)
50-70%	19 (47.5)
~50%	6 (15.0)
<50%	1 (2.5)
In a typical 7-day week, how many meals (breakfast, lunch, dinner) does your preschool-aged child eat at home?	
My child eats almost all meals at home	3 (7.5)
My child frequently eats one meal outside the home, but usually eats the other two at home	30 (75.0)
My child frequently eats two meals outside of the home, but usually eats one meal at home	5 (12.5)
The number of meals my child eats at home varies from day-to-day	2 (5.0)
In a typical 7-day week, how many meals (breakfast, lunch, dinner) do you eat with your preschool-aged child?	
I eat most meals with my preschool-aged child	1 (2.5)
I regularly eat two daily meals with my preschool-aged child	19 (47.5)

Table 2 - Role in Feeding

I regularly eat one daily meal with my preschool-aged child	16 (40.0)
I do not eat any daily meals with my preschool aged child	0 (0.0)
The meals I eat with my preschool-aged child vary from day-to-day	4 (10.0)

In a typical 7-day week, how many meals (breakfast, lunch, dinner) do you, personally, cook/prepare for your preschool-aged child?

I cook/prepare all meals for my preschool-aged child	5 (12.5)
I regularly cook/prepare two daily meals for my preschool-aged child	21 (52.5)
I regularly cook/prepare one daily meal for my preschool-aged child	10 (25.0)
I do not regularly cook/prepare any daily meals for my preschool-aged child	1 (2.5)
The meals I cook for my preschool-aged child vary from day-to-day	3 (7.5)

3.4. Executive Function, Eating Competence, Adherence to sDOR, and Stress:

Most participants in this study did not meet the threshold for difficulties with executive function—only 2 participants met the threshold for borderline or somewhat deficiency and 4 met the threshold for marginal clinical significance. No participants met the threshold for mild, moderate, or marked deficiencies in executive function.

Most participants were eating competent (77.5%), exhibited high adherence to the Satter Division of Responsibility in Feeding (80.0%), and had up to average stress levels (87.2%). See Table 3. Mean aggregate scores and standard deviations for each questionnaire are reported in Table 4. There was a moderate negative correlation between aggregate BDEFS scores and aggregate ecSI 2.0™ scores ($r_s = -0.488$, $p\text{-value} = 0.001$). There was a strong correlation between aggregate BDEFS scores and aggregate PSS-10 scores ($r_s = 0.816$, $p\text{-value} < 0.001$) and a moderate negative correlation between aggregate sDOR.2-6y™ scores and aggregate PSS-10 scores ($r_s = -0.468$, $p\text{-value} = 0.003$). See Table 4.

Table 3 - Executive Function, Eating Competence, Adherence to sDOR, and Stress Scores

Questionnaire and data	n (%)
BDEFS Percentile Score^a	
Below 76th percentile	34 (85)
76th to 84th percentile	4 (10)
85th to 92nd percentile	2 (5)
ecSI 2.0™ Category^b	
Eating competent	31 (77.5)
Not eating competent	9 (22.5)
sDOR.2-6y™ Category^c	
High adherence to sDOR	32 (80.0)
Low adherence to sDOR	8 (20.0)
PSS-10 Scores^d	
Average or below average	34 (87.2)
Above average	5 (12.8)

- Barkley Deficits in Executive Functioning Scale (BDEFS) is used to measure executive functioning deficiencies. Percentile scores shown are associated with executive functioning deficiencies as follows: (i) <75th percentile: little deficiency; (ii) 76th and 84th percentile: marginal clinical significance; (iii) 85th and 92nd percentile: borderline or somewhat significant deficiency.
- The Satter Eating Competence Inventory (ecSI 2.0™) was used to assess participant eating competence. Aggregate scores were totalled and assigned to either “eating competent” (scores 32-48) or “not eating competent” categories (scores 0-31).
- The Satter Division of Responsibility in Feeding Inventory for 2- to 6-year-olds (sDOR.2-6y™) was used to assess participant adherence to the Satter Division of Responsibility in Feeding. Aggregate scores were totalled and assigned to “high adherence to sDOR” (scores between 24 and 36) or “low adherence to sDOR” (scores between 0 and 23).
- The 10-Item Perceived Stress Scale (PSS-10) was used to assess participants’ perceived stress. Average or below average scores are 20 or under and above average scores are >20.

Table 4 - Mean, Standard Deviation, and Correlation of Executive Function, Eating Competence, Adherence to sDOR, and Stress Scores

	Mean (SD)	Spearman's Correlation Coefficient			
		BDEFS	ecSI 2.0™	sDOR.2-6y™	PSS-10
BDEFS^a	121.7 (22.8)	-	-0.488 ^e	0.067	0.816 ^e
ecSI 2.0™^(b)	35.0 (6.9)	-0.488 ^e	-	0.188	-0.099
sDOR.2-6y™^(c)	26.9 (3.6)	0.067	0.188	-	-0.453 ^f
PSS-10^d	13.5 (6.3)	0.816 ^e	-0.094	-0.468 ^e	-

- a. BDEFS: Barkley Deficits in Executive Functioning Scale aggregate score used to measure executive functioning deficiencies. Total possible aggregate scores are between 89 and 365. Higher scores mean more executive functioning difficulties.
- b. ecSI 2.0™: Satter Eating Competence Inventory aggregate score used to assess participant eating competence. Total possible aggregate scores are between 0 and 48. Higher scores mean higher eating competence.
- c. sDOR.2-6y™: Satter Division of Responsibility in Feeding Inventory for 2- to 6-year-olds used to assess participant adherence to the Satter Division of Responsibility in Feeding. Total possible aggregate scores are between 0 and 36. Higher scores mean higher adherence with the Satter Division of Responsibility in Feeding.
- d. PSS-10: 10-Item Perceived Stress Scale used to assess participants' perceived stress. Total possible aggregate scores are between 0 and 40. Higher scores mean higher stress levels.
- e. denotes p-values <0.05.

3.5. Themes

Answers to “How would you describe your family mealtimes?” and “What things work well when feeding your family?” fell into four themes: descriptions of family mealtimes, parenting around food, kids, and parental feelings. Answers to “What do you wish you could do differently when feeding your family?” fell into four main themes: parental changes, kid changes, outside factors, and positive comments.

3.5.1. Descriptions of family mealtimes

Descriptions of family mealtimes included responses describing some aspect of the meal, such as the setting, the timing, the foods being offered, and the planning and preparation of the meal. Most participant responses included detailed contextual

descriptions that often resulted in the application of multiple codes, sometimes sitting within multiple themes.

After codes were applied, we were able to describe when participants offered responses in alignment with parental adherence to the sDOR (i.e. sitting together at the table, calm atmosphere, eating at regular times, and offering the same food choices to the entire family), out of alignment with parental adherence to the sDOR (i.e. a setting other than together at the table, a chaotic atmosphere, or variable timing of meals), or neutral alignment with parental adherence to the sDOR (i.e. planning and preparation of meals, offering healthy foods, or general descriptions of foods offered).

Table 5 - Exemplary Quotes from the Theme, Descriptions of family mealtimes

Code Category	Code	Quote
Codes aligned with parental adherence to sDOR		
Setting	Together at the table	<i>"Dinners we eat together sitting at the kitchen table" (23)</i> <i>"We often have meals together and eat the same items (like breakfast)" (1)</i> <i>"Sitting down together" (36)</i>
Atmosphere	Calm	<i>"[Meals are] typically calm and fun" (27)</i> <i>"[K]eeping mealtimes fun and enjoyable" (31)</i>
Timing of Meals	Regular	<i>"[We eat at] predictable times" (8)</i> <i>"[H]aving a set routine" (13)</i>
Food Choices	Same	<i>"we all eat the same meal, my son's is cut up a bit differently and with smaller portions" (32)</i> <i>"We all eat the same thing and don't make special meals for anyone." (15)</i> <i>"[F]or the most part, she eats what I eat" (23)</i>

Table 5 - Exemplary Quotes from the Theme, Descriptions of family mealtimes

Codes out of alignment with parental adherence to sDOR		
Setting	Other	<i>"We don't always eat meals together based on different daily schedules" (1)</i> <i>"[B]reakfast on the go, lunch at school or on the go/at counter for toddler" (6)</i> <i>"She eats in a toddler tower at the kitchen counter while I try to get ready for the day" (23)</i>
Atmosphere	Chaotic	<i>"Mealtime can be chaotic- it's hard to keep everyone sitting at the table." (7)</i> <i>"A little chaotic in the morning" (23)</i>
Timing of Meals	Variable	<i>"Breakfast is eaten at different times during the weekday" (26)</i>
Food Choices	Different	<i>"Kids eat different foods than adults." (36)</i> <i>"But for lunch and dinners, we may eat different things (adults vs kid or we all eat what we want)" (1)</i>
Codes with neutral alignment with parental adherence to sDOR		
Planning/ Preparation of Meals		<i>"I plan the meals and grocery shop, my husband does the cooking" (38)</i> <i>"We buy foods in bulk that we know are easy to cook and prepare...It helps to have meals in rotation so that we're not trying to come up with new things" (37)</i>
Food Choices	Healthy	<i>"Healthy and well balanced meals for dinner." (8)</i> <i>"We eat healthy, varied meals" (23)</i>
Food Choices	General	<i>"Predictable types of food." (8)</i> <i>"Offering some different meals to choose from at every meal." (1)</i>

3.5.2. Parenting around food

Responses under the parenting around food theme included any response referencing the parenting style used at the dinner table, offering safe food options, or accommodations offered to children to make mealtimes run smoother. Parenting around food was coded as authoritarian, authoritative, or permissive. Offering safe foods is the practice of offering at least one food that a child is already comfortable eating during a meal. Accommodations offered to children to make mealtimes run smoother included tools like offering novel utensils and taking breaks from the meal, modifying the way foods are presented to accommodate sensory preferences, or short order cooking, which is the practice of making a separate food for a child when they do not want to eat the foods provided.

Parenting around food responses could also be in alignment with parental adherence to the sDOR (i.e. authoritative parenting style or offering safe foods), out of alignment with parental adherence to the sDOR (i.e. authoritarian or permissive parenting style, or short order cooking), or have neutral alignment with parental adherence to the sDOR. Other accommodations, such as use of novel utensils, taking breaks, and accommodating sensory preferences were all categorized as having neutral alignment with parental adherence to the sDOR because it was unclear from the participants' responses if these accommodations were age appropriate considerations that would be in alignment with the sDOR or accommodations made for the express purpose of getting a child to eat more, which would be out of alignment with parental adherence to the sDOR.

Table 6 - Exemplary Quotes from the Theme, Parenting around food

Code Category	Code	Quote
Aligned with parental adherence to sDOR		
Parenting around food	Authoritative	<i>"We tell him he can eat as much or as little as he likes. If he wants more of a food and more is available, we typically let him have more, unless it is something we decided ahead of time would be in limited supply (typically this only applies to fruit or dessert). We don't want him to ea[t] so much fruit that he gets diarrhea, and we offer dessert at the same time as every dinner, but determine ahead of time how much dessert will be offered."</i> (38) <i>"[M]y priority is just getting him to put a variety of food in his mouth, even though I might have concerns that he has not eaten enough, I do not want to force him to eat specific quantities."</i> (32)

Table 6 - Exemplary Quotes from the Theme, Parenting around food

Safe foods		<i>"We always try to include a "safe/accepted" food with each meal." (31)</i> <i>"Having something on the plate I know my child will eat, even if the other things are a bit new or less liked." (4)</i>
Out of alignment with parental adherence to sDOR		
Parenting around food	Authoritarian	<i>"They understand that if they don't eat their dinner, that is it until breakfast. For the most part they will try everything on their plate even if they don't like it." (15)</i>
Parenting around food	Permissive	<i>"[W]e have dropped lots of expectations in favor of harmony and directing our energy toward supporting our oldest child with severe anxiety and some sensory sensitivities" (10)</i> <i>"[O]ffering 2-3 options before meal prep." (13)</i>
Accommodations	Short order cooking	<i>"If our child doesn't like what has been made, we will offer other options to her." (18)</i> <i>"Recently we've started offering a backup option (usually peanut butter and jelly sandwich or a tortilla with cream cheese) if he won't eat the provided meal." (30)</i>
Neutral alignment with parental adherence to sDOR		
Accommodations	Other	<i>"[T]aking breaks and offering new/novel utensils to keep eating interesting." (17)</i> <i>"[H]aving deconstructed meals of up to 4 bowls of things (too many is overwhelming)." (33)</i>

3.5.3. Kids

Responses under the kids theme included discussions of children's food choice abilities, food choice deficits, physical behavior abilities or physical behavior deficits, as well as any discussions of a child being involved in meal preparation, planning, or service. These were all considered to be in neutral alignment to parental adherence to the sDOR because adherence to the sDOR involves a separation of parental feeding responsibilities and child eating responsibilities. While adherence to the sDOR promotes behaviors like children sitting at the table or feeding themselves with utensils, we cannot

ascribe these behaviors to parental adherence to the sDOR. Kid behaviors are instead categorized as abilities or deficits.

Table 7 - Exemplary Quotes from the Theme, Kid behaviors

Code Category	Code	Quote
Abilities		
Kid behaviors	Food choice ability	<i>"My daughter is not a picky eater at all" (23)</i>
Kid behaviors	Physical behavior ability	<i>"Sometimes she eats on her own until she is full." (37)</i> <i>"It depends on my tod[d]ler's mood, but if he's in a good mood he's independent and able to eat while I get things done." (29)</i>
Kid involvement		<i>"Our son likes helping in the kitchen and sets the table." (30)</i> <i>"Getting our toddler involved with food prep (and even foraging)" (31)</i>
Deficits		
Kid behaviors	Physical behavior deficit	<i>"My kids struggle to sit for an extended time at dinner time. They want to get up and play. Sometimes they are not hungry and don't want to sit still." (2)</i> <i>"If he's not feeling well and is clingy, he wants me to feed him and will only eat if I feed him." (29)</i>
Kid behaviors	Food choice deficit	<i>"Commonly a struggle to get the 4 year old to eat the protein." (68)</i> <i>"sometimes my kid doesn't want any of those items [I am serving]" (1)</i>

3.5.4. Parental feelings

Responses under the parental feelings theme included any discussion of how a participant feels about mealtimes, meal planning or preparation, or the feeding relationship. Responses under this theme included:

"It feels a little hectic to get the meals done for dinner sometimes" (35)

“Trusting that our child can listen to his body cues and know if he is hungry or full is SO HELPFUL. It reduces so much feeding stress, especially having grown up as someone who was pressured to finish my plate” (38)

3.5.5. Parental changes

Participants discussed wanting to change their own behaviors related to feeding their families. Participants expressed a desire to offer different foods to their children/families than what they are currently offering (i.e. wanting to offer healthier foods and more variety or wanting to offer the same foods to everyone instead of short-order cooking). Some participants discussed wanting to be more patient with their children. Participants also discussed wanting to have better skills at meal planning, food preparation, and organization.

3.5.6. Kid changes

Participants responded with changes they would like to see in their children such as eating more or being less picky, being able to sit still, and being more involved in meal preparation.

3.5.7. Outside Factors

Responses under the outside factors theme included factors participants wish were different that are outside of their direct control. Participants discussed not having enough time, wishing it was easier to balance parenting and household tasks, wishing food was not so expensive, and difficulties getting a spouse on board with feeding choices.

Some codes fall under multiple themes because they would likely require a combination of personal behavior change, child behavioral change, and changes to outside factors. For example, wanting to eat meals together at the table may require the participant to change the setting, children to be able to sit still, and a schedule that allows for time for family members to stop and eat together. Wishing for a calmer atmosphere may require the participant to set a calm tone, children to be able to sit still, and spousal agreement on how to approach the meal.

3.5.8. Positive comments

Some participants expressed that their meal times are working well and others expressed uncertainty about what they would change.

Table 8 - Exemplary Quotes in response to the question, “What do you wish you could change about feeding your family?”

Theme	Quote
Parental Changes	<i>“I wish I was better at meal planning” (1)</i>
	<i>“I would love if we all ate the same things” (36)</i>
	<i>“More vegetables; healthier (less processed) food” (3)</i>
	<i>“I wish I could figure out a way to make [meals] more efficiently.” (23)</i>
Kid Changes	<i>“I wish the kids would sit still longer” (2)</i>
	<i>“I want my 4 year old to be more open to trying new foods.” (7)</i>
	<i>“More involvement of my son in prepping meals, setting table, cleaning up.” (32)</i>
Outside Factors	<i>“I wish I had more time for cooking and planning. It's hard when both parents are working full time” (17)</i>
	<i>“I wish I wasn't split between meal prep, clean up, and spending quality time with my daughter in the evening” (23)</i>
	<i>“I wish getting take-out food wasn't so expens[iv]e because I'd love to default to that more times during the week.” (37)</i>
Positive Comments	<i>“Nothing, we work well with how we purchase, plan, and cook.” (18)</i>
	<i>“In general though, I'm pretty satisfied with how it's going.” (30)</i>

4. Discussion:

The primary aim of this study was to test whether executive functioning in caregivers of preschool-aged children was related to eating competence and/or adherence to the sDOR. We found a moderate negative correlation between aggregate BDEFS scores and aggregate ecSI 2.0™ scores, suggesting that caregivers with more difficulties with executive function have lower eating competence. A prior study of executive function and eating competence in college students also found a relationship between eating competence and executive functioning skills.²³ We found no correlation between executive functioning and adherence to the sDOR. It is important to note that the study sample had average executive functioning skills overall according to the aggregated BDEFS scores. Our sample also appears to have higher eating competence prevalence (77.5 percent) than has been reported in other recent studies (51 percent and 64

percent)^{8,6} and high adherence to the sDOR (80 percent). Despite a high proportion of participants being both eating competent and having high adherence to the sDOR (64 percent) we found no correlation between eating competence and adherence to the sDOR.

This study found a strong correlation between perceived stress and executive function, suggesting that caregivers experiencing more stress were also experiencing more executive functioning difficulties. Executive function is expected to decrease with increased stress.¹² There was also a moderate negative correlation between perceived stress and adherence to the sDOR. This aligns with a prior study's finding that parents with higher adherence to the sDOR report lower stress levels.⁸

This study was able to provide additional information on how families use the principles of the sDOR in their daily lives. Even participants with high adherence to the sDOR described their family mealtimes with characteristics out of alignment with the sDOR suggesting that families are flexible with their adherence to sDOR. For example, Participant 23 described dinners that are in alignment with the sDOR, where everyone eats the same food together at the table, and breakfasts that are out of alignment with the sDOR, described as chaotic with the child eating at the counter while their parent gets ready. See Table 5. Prior qualitative studies of parents of preschool-aged children have also reported mixed adherence to the recommendations of the sDOR.³⁰

While participants described mealtimes as both in and out of alignment with the sDOR when asked for a general description, participants' descriptions focused only on those aligning with the sDOR when asked about "what is working" during family mealtimes. Participants often described using an authoritative parenting style and offering safe foods when asked what is going well. Responses to the question, "What works well when feeding your family?" leaned very heavily into descriptions and behaviors in alignment with parental adherence to the sDOR, which suggests that caregivers see benefits from adhering to the sDOR and may lend additional support to the use of the sDOR as a framework for feeding young children.

Themes related to eating competence and executive function were not as clear in participant responses as those related to adherence to the sDOR, with the exception of those related to contextual skills. The lack of responses related to the eating attitudes, food acceptance, and internal regulation of eating domains of eating competence seems to be the result of participant responses centering on the act of feeding their families and their child's relationship with food rather than their own relationship with food. Participant responses about what they would like their child's relationship with food to be often hinted at their own relationship with food, but not clearly enough to code as an eating competence domain. Similarly, responses about utilizing an

authoritative parenting style or setting a calm environment during meals may suggest a higher level of executive functioning but not clearly enough for an executive function code. Contextual skills is one of the domains of eating competence and also requires strong executive function. We found responses referencing contextual skills like planning and preparing meals when participants were asked to describe mealtimes or share what is going well. See Table 5, Planning/Preparing of meals. Contextual skills were also very clearly expressed as a difficulty when asked what they wish they could change. For example, Participant 1 expressed a desire to “be better at meal planning.” See Table 8.

It is worth noting that even though the participants in this study were largely from high-income households, were eating competent, had high adherence to the sDOR, average executive function, and average stress levels, almost all participants listed at least one thing they wish they could change about feeding their family. This suggests that even for those who are most likely to succeed, feeding preschoolers can still be difficult.

It is also noteworthy that many of the things that participants wish they could do better are skills that require executive function, like staying calm during meals or being better at planning meals. If participants with average executive functioning skills are struggling with these tasks, it is likely that those who struggle with executive functioning would experience more difficulties.

This study is limited by its small sample size and convenience sampling. The small sample size may have made it difficult to include enough participants with executive function difficulties to show any relationships between executive function, eating competence, and sDOR adherence. While the prevalence of executive functioning difficulties in adult populations is unknown, the prevalence of adult ADHD—a disorder often characterized by difficulties with executive function tasks like organization—is reported to be 4.4%.¹⁵ A much larger sample size would be required to include enough participants with enough executive function difficulties to show any relationships among executive function, eating competence, and adherence to the sDOR. Additionally, because the participants for this study were recruited through a university parenting listserv and included mostly high-income, White women employed full-time, it is possible that even if they have an underlying condition associated with executive dysfunction, they have the means to seek treatment which may alleviate some of the executive function difficulties.

The next steps for this research would include completing the study again with a larger sample size, recruiting participants from a wider range of socioeconomic backgrounds. If using childcare centers to assist with recruiting we would need to find a way to get

stakeholder engagement from the childcare centers so that they would have reason to bring the study to the attention of potential participants. To ensure higher participation rates, it may be necessary to offer participants a small sum or gift card in exchange for their participation in the study.

To better understand the participants' eating competence and executive functioning and how these relate to the experience of feeding their families, additional short-answer questions could be included more directly addressing these aspects. A question asking parents to describe their own relationship with food would supply a clearer picture of participant eating competence. Questions about organization, decision-making, prioritizing, and emotional regulation may provide a clearer picture about participant executive functioning levels. Or questions could ask about how feeding feels on a particularly stressful day, since executive function is often worse in the setting of stress.¹²

5. Conclusion:

The primary aim of this study was to look at the relationship between executive function, eating competence, and parental adherence to the sDOR. We found correlations between eating competence and executive function, stress and executive function, and stress and adherence to the sDOR. We were unable to find any relationship between executive function and adherence to the sDOR, but this might be attributable to the overall average levels of executive functioning reported by participants. We were able to discover more about our secondary aims to learn more about caregivers' perceptions of family mealtimes and what themes are present in their responses. Participants' responses to the short-answer questions in this study provided more nuance to the ways that the sDOR is used in practice during mealtimes. Even though participants had very high rates of adherence to the sDOR, participants' described mealtimes that were both in and out of alignment with the sDOR depending on the context of the meal. Participants were more consistent in describing behaviors in alignment with the sDOR when asked about what works well for them suggesting that caregivers find the sDOR to be a valuable strategy for feeding preschoolers.

One finding was that even parents who are set up to succeed still have things they wish they could change about the experience of feeding their family. Many of the things that caregivers are struggling with, like planning meals or managing time, are tasks that likely utilize executive functions and we would expect those with lower executive functioning abilities to struggle with these and other aspects of family mealtimes.

A larger study, recruiting more varied participants from diverse settings and economic strata would likely include enough individuals experiencing executive functioning difficulties to examine the relationships between executive functioning, eating competence, and parental adherence to the sDOR. Possible recruitment pools for future research could include the WIC or Head Start program.

The preschool years are important for establishing parental feeding behaviors that will support children's ongoing relationship with eating. The sDOR is a valuable tool for parents to use when establishing this feeding relationship, but may require parents to rely on executive function skills making it difficult for parents who have deficits in executive functioning to follow. A better understanding of the relationship between executive functioning and the sDOR—which could be gained through repeating this study in a larger, more diverse population—could help assess if parents experiencing executive functioning difficulties require extra support in the feeding relationship. Future directions for assistance could be: additional education on the sDOR for parents with executive functioning difficulties; a modified sDOR geared toward families with executive functioning difficulties; or executive functioning training for families to help gain executive functioning skills that could be utilized in other parenting tasks.

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