PSYCHOSOCIAL AND DEMOGRAPHIC VARIABLES ASSOCIATED WITH

PARENT MEALTIME BEHAVIOR IN YOUNG CHILDREN RECENTLY

DIAGNOSED WITH TYPE 1 DIABETES

A Thesis

by

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ABSTRACT


        Mealtime management can be challenging for parents of children who are newly

diagnosed with type 1 diabetes (T1D), as the treatment of T1D entails an increased focus

on food to guide insulin dosing, the core component of T1D management. Research

suggests that parent behaviors at mealtime early in a child's life may influence the

child's approaches and attitudes towards food later in life. However, little is known

about the underpinnings of these patterns in young children with a recent diagnosis of

T1D. Examining the psychological correlates of parental mealtime behavior may clarify

intervention targets for parents in relation to T1D management at mealtimes. Parent and

family factors, including fear of hypoglycemia, overall functioning, and problem-

solving, may be related to how parents manage difficulties in mealtimes and mealtime

stress. There may also be demographic differences, such as sex of child with T1D and

race/ethnicity of parent and child, in mealtime patterns. This study seeks to better

understand psychosocial and demographic variables associated with problematic parent

mealtime behavior soon after the child's T1D diagnosis.

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**Contributors**

This work was supervised by a thesis committee consisting of Texas A&M University Clinical Professor Heffer and Associate Professor Fields of the Department of Psychological and Brain Sciences, Professor Street of the Department of Communications, and Baylor College of Medicine Department of Pediatrics at Texas Children's Hospital Associate Professor Hilliard.

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NOMENCLATURE

| | |
|---|---|
| ED | Eating disorders |
| DEB | Disordered eating behaviors |
| T1D | Type 1 diabetes |
| FAAR | Family Adjustment and Adaptation Response |
| BPFAS | Behavioral Pediatric Feeding Assessment Scale |
| HFS-PYC | Hypoglycemia Fear Survey-Parents of Young Children |
| SPSI-R:S | Social Problem Solving Inventory Revised-Short Form |
| PFS | Protective Factors Survey |
| SES | Socioeconomic Status |

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## 1. INTRODUCTION

### 1.1. Parent Behaviors at Mealtime

Young children often engage in a variety of behaviors that can disrupt mealtimes, such as picky eating, extended mealtimes, and leaving the table before the meal has finished (Cardona Cano et al., 2016; Cole, Musaad, Lee, Donovan, & Team, 2018; Patton et al., 2004). Parent responses to these child mealtime behaviors are associated with the persistence of these behaviors and the potential development of maladaptive eating behaviors (Loth, Friend, Horning, Neumark-Sztainer, & Fulkerson, 2016; McPhie, 2012; Powell, Farrow, Meyer, & Haycraft, 2018). Problem parent mealtime behaviors include pressuring to eat, restricting foods, preparing an alternative meal, and anger and anxiety during mealtime (Rodgers et al., 2013; Scaglioni, Salvioni, & Galimberti, 2008; Stice et al., 1999).

Characteristics of the feeding environment could potentially impact current and future mealtime behaviors. A responsive feeding environment centers on a pleasant, predictable environment with few distractions, with the child seated comfortably, facing forward, with clear expectations of behavior. In a responsive feeding environment, caregivers are responsive to the child's feelings of satiety and hunger and respond promptly in an emotionally supportive way (Black & Aboud, 2011). A positive, responsive mealtime climate and mealtime rituals have been associated with lower odds of picky eating at a one-year follow up (Cole et al., 2018). In contrast, a nonresponsive feeding environment ignores child satiety cues, lacks reciprocity between parent and child, and lacks predictable and consistent mealtimes (Black & Aboud, 2011; Cole et al.,

2018). This nonresponsive environment is also associated with restriction, pressure to eat, and an authoritarian parenting style (Black & Aboud, 2011; Cole et al., 2018; Hughes, Power, Fisher, Mueller, & Nicklas, 2005). Authoritarian parenting style, characterized by high control and low reciprocity of child behavior, has also been associated with low level of child food intake (Hughes et al., 2005).

Parent modeling of food behavior can influence a child's approach towards food. Covert control of the feeding environment (i.e., parents avoiding buying and keeping certain foods in the home without child awareness/observation), was associated with decreased unhealthy child behavior three times more than more overt behaviors (i.e., children observing parents restricting portion size) (Musaad et al., 2017). Conversely, parent modeling of unhealthy eating behavior can also influence child food choice. Children aged 3-5 years with mothers who reported using food to regulate emotion ate more cookies and chocolate in the absence of hunger than children with mothers who reported not using food for emotional coping (Blissett, Haycraft, & Farrow, 2010). Overt maternal restriction of foods at age 4 was also associated with greater preferences towards energy dense foods at age 6. This finding indicates that parental behaviors may be associated with child food preferences throughout development  (Boots, Tiggemann, & Corsini, 2019). The environment, structure, and parent behavior can all influence child eating patterns.

**1.2. Parent Mealtime Behaviors in a Type 1 Diabetes (T1D) Population**

T1D is a chronic autoimmune disease that affects the functioning of β-cells in the pancreas, which produce insulin in response to glucose in the bloodstream (American Diabetes Association, 2020; Wood, Peters, Ziotas, & Gebel, 2017). In T1D, the immune system attacks these β-cells, and the pancreas can no longer produce enough insulin to effectively lower blood glucose (Wood et al., 2017). In children, the onset of T1D is typically a significant, acute health event with symptoms like frequent thirst, urination, weight loss, fatigue, and high risk for diabetic ketoacidosis (DKA) which can be life-threatening. The long-term management of T1D requires injection of insulin to keep glucose levels in an acceptable range (Wood et al., 2017). Intensive insulin therapy, or use of insulin injections, pens and pumps, requires calculation of carbohydrates and the corresponding insulin dose at every meal and snack and throughout the day and night.

Eating and mealtimes can be stressful for families managing T1D as they balance spontaneity, carbohydrate counting, and insulin administration. While technological advances have allowed for better tools to measure and track blood glucose values, individuals with T1D must remain mindful of the amount and carbohydrate content of the foods they consume. Ideally, insulin is administered before eating to maximize the insulin action in relation to carbohydrates being processed in the body (American Diabetes Association, 2020; Rovner & Nansel, 2009), however this can be challenging in young children as it can be difficult to predict what foods they will eat, how much, and when (Freeborn, Dyches, Roper, & Mandleco, 2013; Streisand & Monaghan, 2014). For younger children, parents handle the cooking and diabetes management

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responsibilities, which includes the carbohydrate counting and insulin dosing before a meal. When children do not eat as much as the parent planned, or want to eat something else, parents must manage these child behaviors and make sure their carbohydrate consumption is close to the insulin dose administered (Freeborn et al., 2013; Rovner & Nansel, 2009).

Mealtime behavior in young children with chronic diseases are challenges for parents that manage nutrition and medication (Powers, Patton et al., 2002; Patton et al., 2008). Parents of young children with T1D report greater behavioral problems during mealtime, more stress during mealtime, and less confidence around feeding compared to parents of children without T1D (Powers et al., 2006, Patton et al., 2006; Patton et al. 2004; Patton et al. 2002; Powers et al., 2002). Compared to earlier insulin regimens that dictated the amount of carbohydrates and insulin children should receive at each meal, intensive insulin therapy has provided more flexibility with diabetes management but has not shown a significant reduction in parent perceptions of more problem child behavior at mealtime (Patton, Williams, Dolan, Chen & Powers, 2009). T1D management can disrupt family functioning, and parents with low frustration tolerance or lower problem-solving ability before T1D diagnosis can struggle with insulin dosing and mealtime management (Patton et al., 2009). The stress of managing mealtimes and new medication regimens, accompanied with disruptions in family functioning, can be associated with heightened parental emotions.

Many parents that have a young child diagnosed with T1D are often overwhelmed, anxious and distressed (Whittemore, Jaser, Chao, Jang, & Grey, 2012).

Beyond the emotional toll this diagnosis may cause to a family, many parents report disruptions in daily routines due to new diabetes management responsibilities. Some families even report a loss of spontaneity and freedom, especially with food (Sparud-Lundin, Hallström, & Erlandsson, 2013). Families may struggle with food from restaurants or new foods that require closer calculations, and many families impose restrictions on their routines to manage the uncertainty (Sparud-Lundin et al., 2013). Parent mealtime management behaviors may manifest as pressuring the child to eat to match insulin dosing or restricting foods to manipulate blood glucose levels or reduce insulin needs. Based on these findings, researchers have suggested behavior management strategies to help the child stay at the table and finish meals, such as to praise desired behaviors and ignore misbehavior (Patton, Odar, Midyett, & Clements, 2014). Fewer efforts address the parental psychosocial elements directly that relate to mealtime anxiety.

**1.3. Theoretical Models**

Social-ecological models of childhood chronic illness and family systems approaches explain the influence of parents and the environment on child development (Kazak, 2006). The chronically ill child is at the center of the family microsystem, and illness-related stress can spread to parents, siblings, and other family members as they try to find a new equilibrium after diagnosis (Bronfenbrenner, 1994; Kazak, Rourke, & Crump, 2003). A stressor such as a T1D diagnosis can affect parental behavior and family structure in response to increased stress of disease management (Kazak, 2006). Increasing parental support, especially psychosocial support, can help adjust the family

system over time (Kazak, 2006). Kazak's Pediatric Psychosocial Preventative Health Model (PPPHM) emphasizes parent support, while understanding that certain families may require differing levels of care. Understanding and screening for mealtime difficulties, especially early in a T1D diagnosis, can help families receive targeted levels of care and support that match the needs of the family (Kazak, 2006).

The Family Adjustment and Adaptation Response (FAAR) Model also serves as a structure to describe parental mealtime behavior (Patterson & Garwick, 1994). A crisis event, such as a T1D diagnosis, can disrupt the family balance, causing the family to engage in adaptive behaviors to regain this balance. To regain equilibrium, families gain skills, attempt new coping mechanisms, and try to reduce the demands that exist in the family system. These coping mechanisms can be adaptive, such as increasing communication and social support, or maladaptive, such as increased family conflict, parental control, enmeshment, or denial (Patterson & Garwick, 1994; Kazak, 2006). Over time, a family can adapt to this crisis by gaining new skills, reducing demands, or changing meaning and concepts about themselves or their family system (Kazak, 2006). A crisis event can also amplify family and parental characteristics that existed before the crisis event. Parental skills, problem solving abilities, and larger family functioning can improve through the challenge of T1D management or can highlight challenges that existed pre-diagnosis. Capturing mealtime behavior so early after diagnosis allows monitoring of these behaviors at a crisis point and early adaptation, (Patterson & Garwick, 1994).

**1.4. Psychosocial concerns**

**1.4.1. Fear of hypoglycemia**

Hypoglycemia, or blood glucose levels between 54 and 70 mg/dL, may be caused by a mismatch between insulin to carbohydrate intake and/or physical activity (Patton, Dolan, Henry, & Powers, 2008; Viaene, Van Daele, Bleys, Faust, & Massa, 2017). Episodes of hypoglycemia range from mild (with nausea, irritability, and faintness) to severe (Agiostratidou et al., 2017). Severe hypoglycemic events can result in seizures, coma and death, and require vigilance and prompt management of low blood glucose values (Agiostratidou et al., 2017; Viaene et al., 2017; American Diabetes Association, 2020). Hypoglycemic events are especially worrisome for parents of young children, where food preferences and intake can vary and food refusal is common (Streisand & Monaghan, 2014; Patton et al., 2008). Developmentally, young children are often unable to recognize and communicate symptoms of hypoglycemia, so parents must constantly monitor their children for possible signs. Worry around hypoglycemia can also be associated with mealtime stress, since mealtimes are key periods of carbohydrate consumption and insulin administration. More parent mealtime problems have been associated with worse hypoglycemic worry in young children with T1D (Monaghan et al., 2015).

**1.4.2. Problem Solving**

Scheduling and planning meals along with insulin intake can be a difficult task for parents, especially soon following T1D diagnosis. Better problem-solving skills are related to more engagement in diabetes management and disease-related distress in

youth (ages 9-14) with T1D (Wysocki et al., 2008). In youth with T1D, problem-solving skills were related to HbA1c levels only after contributions of parent behavior were accounted for, suggesting that parents play a large role in problem solving (Wysocki et al., 2008). Flexible and non-restrictive approaches, such as intuitive eating, continuing family meal patterns, and using a best estimate of carbohydrate consumption have been recommended by medical professionals for adolescents with T1D (Candler, Murphy, Pigott, & Gregory, 2018). While these approaches are useful in integrating and normalizing T1D management and eating, parents of young children need to calculate and account for possible unplanned carbohydrates or carbohydrates that the child did not want to consume. These approaches require parents to use problem solving skills to manage challenges, such as blood glucose fluctuations and unplanned hunger cues. (Candler et al., 2018). Limited research exists addressing the relationship between parent problem solving and mealtime behavior, especially in young children with T1D.

**1.4.3. Family Functioning**

Family functioning includes family conflict, family guidance/control, and in T1D, management of diabetes care tasks (Patton, Piazza-Waggoner, Modi, Dolan, & Powers, 2009). In childhood, high family cohesion and family functioning predict better T1D adherence (Cohen, Lumley, Naar-King, Partridge, & Cakan, 2004), including specific associations between better dietary adherence in young children and better family functioning (Patton et al., 2009). Further, children with T1D that have more rigid, coercive caregivers, experience more disrupted meals and have poorer dietary adherence (Patton et al., 2009). Family functioning during mealtime, especially in families with

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children managing T1D, may be associated with poorer mealtime management behaviors. Examining family functioning in intervention efforts may help to improve the family system, extending to improvements in mealtime communication.

**1.5. Gaps in the Literature**

Parent mealtime management and psychological correlates (fear of hypoglycemia, problem solving and family functioning) close to diagnosis are not present in the current literature. Studies that address mealtime behaviors in young children often are often limited to children with at least 6 months diabetes duration (Patton et al., 2008; Patton, Piazza-Waggoner, Modi, Dolan, & Powers, 2009; Patton, Dolan, Smith, Thomas, & Powers, 2011; Powers et al., 2002) and thus are not informative about the early experiences in the immediate post-diagnosis period. There is a gap in understanding the early psychosocial experiences and mealtime behaviors in the first 1-2 months after diagnosis, while families are adjusting to the new diagnosis and mealtime routines are still developing. Thus, we sought to examine relationships among fear of hypoglycemia, problem solving and family functioning in relation to parent mealtime management behaviors in children diagnosed with T1D in the previous 8 weeks.

A better understanding of psychosocial correlates and parental feeding behaviors, especially soon after the child's diagnosis of T1D, can inform future intervention efforts and increase parental support for diabetes management during mealtime. Parent problem solving has limited research in the mealtime setting in young children with T1D. Problem-solving issues could extend to diabetes management tasks outside of mealtime, adding to its importance as an intervention target.

## 2. AIMS/HYPOTHESES

### 2.1. Psychosocial Aims

The aim of this study was to evaluate psychosocial variables that may be correlates of problem parent mealtime behaviors in parents of young children with newly diagnosed T1D, specifically fear of hypoglycemia, problem-solving, and family functioning. The primary aim was to examine associations among problem parental mealtime behaviors in parents with a young child recently diagnosed with T1D and three potential psychological constructs:  (a) fear of hypoglycemia (as measured by HFS-PYC Worry subscale) (Cox, Irvine, Gonder-Frederick, Nowacek, & Butterfield, 1987); (b) problem solving (as measured by SPSI-R:S) (D'Zurilla, Nezu, & Maydeu-Olivares, 2002); and (c) and family functioning (as measured by the Family Functioning/Resiliency subscale of the PFS) (Counts, Buffington, Chang-Rios, Rasmussen, & Preacher, 2010). Based on the literature, the hypothesis was that parents with higher fear of hypoglycemia, lower problem-solving ability, and poorer family functioning would have more mealtime problem behaviors.

### 2.2. Demographic Variables

A secondary aim was to evaluate possible demographic differences in parents' problematic mealtime behavior. Parental habits and problematic behaviors concerning food and mealtimes, like restriction, that begin soon after diagnosis, might differ between parents of girls and boys. For example, mothers of children without T1D praise girls twice as much as boys for eating during mealtime and girls were more likely than

boys to seek approval for eating during mealtime (Orrell-Valente et al., 2007). Parents of children without T1D monitor boys' intake of junk food, sweets and fat intake more than girls' intake, indicating a potential difference in parental concern (Spruijt-Metz et al., 2002). Child sex differences in parent mealtime behavior in early childhood and early after diagnosis may be related to a larger understanding of parental influences on child mealtime behavior. Given the reported differences in gendered eating behaviors in adolescence (Orrell-Valente et al., 2007; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002), differences in parent mealtime management between boys and girls at mealtime could be associated with eating environmental cues early in development.

In addition to gender, race/ethnicity may be associated with differences in parental mealtime behaviors and management of a new T1D diagnosis. Racial/ethnic differences in HbA1c are reported in children and adolescents with T1D, with Hispanic/Latino and Black/African American children tending to have higher HbA1c than Non-Hispanic White children and adolescents (Berry et al., 2010; Borschuk & Everhart, 2015; Willi et al., 2015). Any cultural/ethnic differences in mealtime behaviors, especially in the T1D population, remains unclear.  In the general population, limited research indicates differences in mealtime functioning and communication, with Hispanic and Asian American parents exhibiting more directive behavior, like encouragement to eat all food presented, than White Non-Hispanic families (Kong et al., 2013; Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2013). Mealtimes filled with more behavior direction have been associated with poor dietary adherence and mealtime stress (Fiese, Hammons, & Grigsby-Toussaint, 2012).  Race/ethnicity

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differences in parent mealtime behaviors in T1D has limited research. More information on these nuances could improve and guide culturally competent interventions and parent education on mealtime interactions. Based on the literature, I hypothesized that Hispanic/Latino and Black/African American parents would report lower family functioning and higher mealtime problem behaviors than non-Hispanic white parents. I also hypothesized parents of girls would report higher frequency and problematic perception of mealtime behaviors than parents of boys.

## 2.3. Clinical Variables

Continuous glucose monitors (CGM) are diabetes management devices worn on the body that provide measurements of glucose concentrations every 5 minutes. This frequency of measurement allows for the parent or individual with T1D to see a more complete picture of their glucose trends and fluctuations (Patton et al., 2011). In younger children, early adoption of CGM can help parents better understand blood glucose values among high activity and hard to predict eating habits (Patton et al., 2011). Parents also reported that using CGM made them feel less worried, more confident in child's safety, less need for fingerstick blood glucose tests, and they felt their children had more in range glucose values (Hilliard et al., 2019). While CGM use can help parents guide their management behaviors, worry and stress surrounding T1D can persist (Youngkin et al., 2020). The volume of data can be extremely helpful in monitoring trends and patterns as parents adapt to a new diagnosis, but the amount of new information may be overwhelming (Patton & Clements, 2012; Hilliard et al., 2019). The device itself can also have a painful insertion, disruptive alerts, and have adhesive problems that can also

deter parents from use (Hilliard et al., 2019). Examining the relation of CGM use to other psychosocial variables can further clarify how this technology can help families, especially in an early diagnosis mealtime setting. I hypothesized that parents using CGM for T1D management in their children would report more problematic mealtime behaviors than parents not using CGM, based on having more information for diabetes management.

# 3. METHODS

## 3.1. Participants

The data for this master's thesis are from baseline surveys from an NIH-funded R01 study (1R01DK102561; PI: Streisand), "A Stepped Care Behavioral Intervention Trial for Young Children with T1D" (First STEPS), conducted in Washington, DC and Houston, TX. First STEPS is a stepped-care intervention targeting social and clinic support for parents of children under age 7 years during the year after a T1D diagnosis. I used First STEPS baseline data to evaluate associations among parental behaviors at mealtime, demographic variables, and psychosocial variables. The First STEPS baseline dataset is ideal for this secondary data analysis because it focuses on two aspects of early development that may have implications for eating behaviors: early childhood and early post-diagnosis. The aims and following analyses used baseline data from primary caregivers (one parent/family) only. These parents agreed to participate in a behavioral RCT, First STEPS, a stepped care intervention study for children newly diagnosed with type 1 diabetes. Parents were recruited while the child was hospitalized for a new diagnosis of type 1 diabetes, or shortly following discharge from the hospital after T1D diagnosis (n= 398 approached, n=217 primary caregivers consented, n=170 primary caregivers enrolled). Enrollment and baseline data collection took place within 8 weeks of diagnosis (M=29 days, SD=15). Baseline surveys were distributed through a link to a secure, HIPAA-compliant research platform (REDCap, (Hilliard, Tully, Monaghan, Wang, & Streisand, 2017)) for participants to complete at their convenience. Inclusion

criteria included: parent adequate understanding of English and self-identification of primary caregiver for the child with T1D. Exclusion criteria were serious mental illness or developmental disability in the parent that would make participation difficult, life-threatening disease or developmental disability in the child, and not having fluency in English.

## 3.2. Measures

**Behavioral Pediatric Feeding Assessment Scale.** Parent problem mealtime behaviors were measured by the Behavioral Pediatric Feeding Assessment Scale (BPFAS), which assesses the frequency of and perception of parent mealtime behaviors like pressuring to eat, threats, and confidence to manage mealtimes (Crist & Napier-Phillips, 2001). The BPFAS is a 35-item scale that assesses current parent report of feeding and mealtime behavior to identify feeding problems in children with medical conditions (Bandstra, Crist, Napier-Phillips, & Flowerdew, 2011; W. Crist, 2001). The first 25 items address child behavior, (e.g., "My child takes longer than 20 minutes to finish a meal"; "My child gets up from table during meal") and the last 10 items address parents' feelings toward and strategies for managing mealtime behavior, (e.g., "I get frustrated and/or anxious when feeding my child"; "I use threats to get my child to eat") (William Crist & Napier-Phillips, 2001). The four behavioral subscales are: Child Frequency Score (how often a child exhibited a particular mealtime behavior), Parent Frequency Score (how often a parent exhibited a particular mealtime behavior), Child Problem Score (number of problematic child behaviors at mealtime), and Parent Problem Score (number of problematic parent behaviors at mealtime) (Crist & Napier-

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Phillips, 2001). The Frequency subscales are scored on 5-point Likert scales from 1 for "never" and 5 for "always" with higher scores representing problem feeding behaviors. The Problem subscales are scored by the parent answering "yes" or "no" to the question, "Is this a problem for you?" after each Likert item (Crist & Napier-Phillips, 2001). An elevated clinical score on the BPFAS Frequency scale is 20, and an elevated clinical score on the BPFAS Problem scale is 2. The Parent Frequency and Problem scales are being used in the current study. Internal consistency was sufficient for both scales in this sample (Parent Frequency α=.82; Parent Problem α=.80).

**Fear of Hypoglycemia**. Parent fear of hypoglycemia was measured by the Hypoglycemia Fear Survey-Parents of Young Children (HFS-PYC) which is a modification of the HFS validated in adults with T1D, (Irvine, Cox, & Gonder-Frederick, 1994). The HFS-PYC yields two subscale scores: (a), Worry, which reflects parent concerns about the occurrence of hypoglycemia and (b) Behaviors, which reflects actions the parent engages in to avoid a hypoglycemic event, (Patton, Dolan, Smith, Thomas, & Powers, 2011). The HFS-PYC is scored on a 5-point Likert scale with 1 for "never" and 5 for "always" with higher scores representing greater fear. The Worry subscale was included in the baseline surveys. The internal consistency for the Worry subscale in this sample was high (α=.92).

**Problem Solving.** Problem solving was measured with the Social Problem-Solving Inventory Revised-Short Form (SPSI-R:S; (D'Zurilla, Nezu, & Maydeu-Olivares, 2002), which includes 52 items and five subscales: positive problem orientation, negative problem orientation, rational problem solving,

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impulsivity/carelessness style, and avoidance style. This study uses a 25-item version that included all the scales except rational problem solving. The items address current problem-solving skills and are scored on a 5-point Likert scale with 0 for "not at all true of me" to 4 for "extremely true of me", with higher scores meaning thoughts, emotions and behaviors associated with better problem-solving ability, (D'Zurilla et al., 2002; Hawkins, Sofronoff, & Sheffield, 2009). The current study is using the Total score to assess problem solving. The internal consistency for this measure was high in this sample ($\alpha$=.90).

**Family Functioning.** Family functioning was measured with the Family Functioning subscale of the Protective Factors Survey (PFS; Counts, Buffington, Chang-Rios, Rasmussen, & Preacher, 2010). The Family Functioning subscale measures the current well-being of the family, including how to openly share positive and negative experiences and persevere in times of crisis, (e.g., "In my family we talk about problems" and "In my family, we take time to listen to each other") .This subscale contains 5 items, with a 7-point Likert scale with 1 for "never" and 7 for "always" with higher scores meaning higher functioning (Counts et al., 2010). The internal consistency for the Family Functioning Subscale was high in this sample ($\alpha$=.89).

## 3.3. Clinical and Demographic Variables

CGM use, child sex, parent sex, and race/ethnicity are all collected as a part of the baseline surveys collected via REDCap after agreement of participation. CGM use was assessed with the question, "Does your child use a Continuous Glucose Monitor (CGM)?" and defined with a binary yes/no. Child sex was collected via medical record

upon admission and was analyzed with binary female/male. Parent sex was assessed with the question "What is your sex?" and the answer options female, male, other, and decline. Parent sex was analyzed using male/female categories only. Race was assessed with the question "What is your racial background?" with the options: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White or decline. Additionally, Hispanic, or Latino ethnicity was separately assessed with the question "Are you of Hispanic/Latino descent?". These race and ethnicity variables were combined for the analysis into the categories: Non-Hispanic White, Non-Hispanic Black, Hispanic, and Other Non-Hispanic. Other demographic and clinical variables such as: parent level of education, employment, marital status, number of other children in the home, other caregivers in the home, child insurance type and estimated yearly household income were self-reported in baseline measurements via REDCap.

# 4. ANALYSES

## 4.1. Analysis

Descriptive statistics examined mean, standard deviation, and range for continuous variables first. Descriptive statistics were collected for each item on the BPFAS to determine endorsement level in the sample. Correlations, *t*-tests and ANOVAs determined the bivariate relationships between demographic variables, psychological and behavioral measures: HFS-PYC, SPSI-R:S, Family Functioning/Resiliency subscale of the PFS, and BPFAS (Parent Frequency Scale). ANOVA analyses compared scores from racial/ethnic groups.

Hierarchical regression analyses then examined the study hypotheses. Significant relationships ($p \leq .05$) with independent demographic and psychological/behavioral variables with the dependent variable, BPFAS scores, determined the amount of variance each variable contributes to the frequency and perception of parent mealtime behaviors. To control for demographic variables, these were entered first, with Step 1 containing demographic variables and Step 2 containing the psychosocial scale scores.

Assumptions were performed to determine that regression was a good statistical fit. To determine linearity, scatter plots between psychosocial variables and BPFAS Parent Frequency and Problem scales confirmed a linear relationship between variables. Homoscedasticity, or equal variances of the residuals, were confirmed through plots of regression standardized residuals and regression standardized predicted value. Finally,

normality of the data was determined by using normal probability plots for BPFAS

Parent Problem and Frequency scales.

# 5. RESULTS

## 5.1. Participant Characteristics

The study sample consisted of 157 parents of 157 children age 1-6 years old recently

diagnosed with type 1 diabetes. Participants were primarily mothers, with a mean age of

34.8 years (SD=7.0). Table 1 summarizes participant characteristics, including parent

demographics and children's diabetes characteristics at the time of baseline

questionnaire completion (within 8 weeks of T1D diagnosis). Parent participants were

mostly Non-Hispanic White, female, married, and had more than 1 child in the home.

**Table 1** Demographic and Clinical Characteristics

| Characteristics | % (n) | M (SD) |
|---|---|---|
| Child Age | | 4.5 years (1.6) |
| Days since Diagnosis | | 29 days (15) |
| Child sex | | |
|     Female | 55% (86) | |
|     Male | 45% (71) | |
| Parent age | | 34.8 years (7.0) |
| Parent sex | | |
|     Female | 91% (143) | |
|     Male | 9% (14) | |
| Parent Employment | | |
|     Full time | 57% (89) | |
|     Part time | 8% (12) | |
|     Not employed outside the home | 29% (46) | |
|     Student | 3% (5) | |
|     Declined to answer | 3% (5) | |

**Table 1** continued

| Characteristics | % (n) | M (SD) |
|---|---|---|
| Parent Race/Ethnicity | | |
|    Non-Hispanic White | 62% (97) | |
|    Non-Hispanic Black | 14% (23) | |
|    Hispanic | 12% (19) | |
|    Other Non-Hispanic | 11% (17) | |
| Parent Level of Education | | |
|    High school diploma or lower | 12% (20) | |
|    Partial college | 18% (28) | |
|    2 year college | 16% (25) | |
|    4 year college | 25% (39) | |
|    Graduate/Professional Training | 29% (45) | |
| Parent marital status | | |
|    Married | 74% (117) | |
|    Not Married | 23% (36) | |
|    No Answer | 3% (4) | |
| Number of children in home | | |
|    More than 1 | 75% (118) | |
|    One child | 25% (25%) | |
| Other caregiver in home | | |
|    No other caregivers in the home | 11% (17) | |
|    Other caregivers in the home | 89% (139) | |
| CGM use at baseline | | |
|    CGM use | 20% (31) | |
|    No CGM use | 80% (125) | |
| Child insurance type | | |
|    Public insurance only | 27% (43) | |
|    Private or Other Insurance | 71% (112) | |
|    No answer | 2% (2) | |
| Estimated Yearly Household Income | | |
|    <$100,000 per year | 54% (73) | |
|    >$100,000 per year | 40% (62) | |
|    No answer | 14% (22) | |
| Site | | |
|    Children's National Medical Center, Washington, DC | 51% (80) | |
|    Texas Children's Hospital, Houston, TX | 49% (77) | |

**5.2. Items Endorsed in the BPFAS Frequency Scale**

On average, parents reported problem mealtime management behaviors were moderately frequent (M=18.84, SD=4.95) and that they perceived their children's mealtime behaviors as somewhat problematic (M=1.26, SD=2.16). Table 2 presents means and standard deviations for all BPFAS Frequency and Problem Scale items. Higher scores indicate more frequent problem behaviors.

**Table 2** BPFAS Scale Items (Parent Problem and Frequency Scales)

| Item | Parent Frequency | | Parent Problem | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| "If my child does not like what is served, I make something else" | 3.2 | 1.2 | 0.2 | 0.4 |
| "I get frustrated or anxious when feeding my child" | 2.4 | 1.0 | 0.20.4 | 0.4 |
| "I coax my child to get him/her to take a bite" | 2.4 | 1.1 | 0.2 | 0.4 |
| "I feel confident in my ability to manage my child's behavior at mealtime" | 1.9 | 0.9 | 0.2 | 0.4 |
| "I disagree with other adults (i.e. my spouse, the child's grandparents) about how to feed my child" | 1.8 | 0.9 | 0.1 | 0.3 |
| "I feel confident that my child gets enough to eat" | 1.8 | 0.9 | 0.2 | 0.4 |
| "I feel that my child's eating pattern hurts his/her general health" | 1.6 | 0.8 | 0.2 | 0.4 |

**Table 2** continued

| | Parent Frequency | | Parent Problem | |
|---|---|---|---|---|
| "I use threats to get my child to eat" | 1.4 | 0.8 | 0.1 | 0.3 |
| "When my child has refused to eat, I have to put food in his/her mouth by force if necessary" | 1.2 | 0.5 | 0.0 | 0.2 |
| "I get so angry with my child at mealtimes that it takes me a while to calm down after the meal" | 1.2 | 0.5 | 0.1 | 0.2 |

## 5.3. Bivariate Analyses

Tables 3, 4, and 5 include associations between each independent variable and dependent variable. Table 3 and 4 contain t-tests for demographic variables for Parent Frequency and Problem Scales separately, and Table 5 includes correlations for the continuous psychosocial variables.

**Table 3** BPFAS Frequency Score t-tests/ANOVA across demographic and clinical variables

| | M | SD | t | f | df | Sig. (2-tailed) | 95% Confidence Interval |
|---|---|---|---|---|---|---|---|
| Parent Sex | | | 1.56 | | 155 | .12 | [-.57, 4.9] |
| Female | 19.1 | 5.0 | | | | | |
| Male | 16.9 | 4.7 | | | | | |
| Child Sex | | | | | 155 | .97 | [-1.6, 1.6] |
| Female | 18.9 | 5.0 | -.04 | | | | |
| Male | 18.9 | 4.9 | | | | | |
| Parent Race | | | | .980 | 3 | .40 | |
| Ethnicity | 18.9 | 4.6 | | | | | |
| Non-Hispanic White | 17.5 | 5.2 | | | | | |
| | 19.9 | 6.4 | | | | | |
| Non-Hispanic Black | 19.5 | 5.0 | | | | | |
| Hispanic | | | | | | | |
| Other Non-Hispanic | | | | | | | |

**Table 3** continued

|  | M | SD | t | f | df | Sig. (2-tailed) | 95% Confidence Interval |
|---|---|---|---|---|---|---|---|
| CGM Use |  |  |  |  |  |  |  |
| No CGM use | 18.5 | 4.8 | -2.5 |  | 154 | **.01\*\*** | [-4.4,-0.5] |
| CGM use | 20.9 | 5.23 |  |  |  |  |  |

*p<.05 **p≤.01

**Table 4** BPFAS Problem Score t-test/ANOVA across demographic and clinical variables

|  | M | SD | t | f | df | Sig. (2-tailed) | 95% Confidence Interval |
|---|---|---|---|---|---|---|---|
| Parent Sex |  |  |  |  |  |  | [-.72, 1.7] |
| Female | 1.3 | 2.2 | .785 |  | 155 | .43 |  |
| Male | .86 | 1.5 |  |  |  |  |  |
| Child Sex |  |  |  |  |  |  | [-0.8, 0.5] |
| Female | 1.2 | 2.2 | -.408 |  | 155 | .68 |  |
| Male | 1.4 | 2.2 |  |  |  |  |  |

**Table 4** continued

| | M | SD | t | f | df | Sig. (2-tailed) | 95% Confidence Interval |
|---|---|---|---|---|---|---|---|
| Parent Race | | | | .850 | 3 | .47 | |
| Ethnicity | | | | | | | |
| Non-Hispanic White | 1.3 | 2.1 | | | | | |
| Non-Hispanic Black | .91 | 1.9 | | | | | |
| Hispanic | 1.9 | 3.1 | | | | | |
| Other Non-Hispanic | 1.1 | 1.6 | | | | | |
| CGM Use | | | | | | | |
| No CGM use | 1.1 | 2.0 | -2.908 | | 154 | **p<.01** | [-2.2, -0.3] |
| CGM use | 2.3 | 2.5 | | | | | |

*p<.05

BPFAS Frequency and Problem subscale scores did not differ significantly across most

demographic variables (parent sex, child sex, parent race/ethnicity). However, BPFAS

Frequency and Problem scores did demonstrate significant differences between parents

of children who used CGM and those whose children did not use CGM. Problem parent

mealtime behaviors were more frequent in CGM users (M=21.05, SD=5.28) than non-

users (m=18.45, SD=4.80), (t(153)=-2.61, p=.01). Parents whose children used CGM

perceived those behaviors as more problematic (BPFAS Problem: M=2.36, SD=2.52)

than parents whose children did not use CGM (BPFAS Problem: M= 1.05, SD=2.00),

(t(153)=-2.65, p<.05).

**Table 5: Correlations among psychosocial variables**

| | M | SD | HFS | PFS | SPSI-R:S | BPFAS Frequency | BPFAS Problem |
|---|---|---|---|---|---|---|---|
| HFS | 44.6 | 11.3 | - | -.21** | -.26** | .20** | .18** |
| PFS | 5.62 | 1.0 | - | - | .46** | -.21** | -.20** |
| SPSI-R:S | 74.1 | 13.5 | - | - | - | -.31** | -.33** |
| BPFAS Frequency | 18.84 | 4.95 | - | - | - | - | .753** |

*p<.05 **p<.01

All psychosocial variables were significantly associated with one another at the p<.01

level. The BPFAS Frequency Scale had a significant positive correlation with the HFS-

Worry Scale (r=.20, p<.01) and a significant negative correlation with the PFS-Family

Functioning Scale (r=-.21, p<.01). The BPFAS Frequency Scale also had a significant

negative correlation with the SPSI (r=-.31, p<.01). The BPFAS Problem Scale was

significantly associated with HFS (r=.18, p<.01) and PFS-Family Functioning (r=-.20,

p<.01). Additionally, the BPFAS Problem Scale was significantly and moderately

associated with SPSI, (r=-.33, p<.01).

## 5.4. Regression Analyses

Hierarchical multiple regressions for both BPFAS Frequency and Problem Scales

examined the association of the independent variables with the frequency of the parent

behavior and perceptions of that behavior. Tables 6 and 7 include results for both

regressions.

**Table 6: Regression Coefficients: BPFAS Frequency Scale**

| Predictor Variables | Model 1: Demographic Variables | Model 2: Demographic + Clinical Variables | Model 3: Demographic + Clinical + Psychosocial Variables | Tolerance | VIF |
|---|---|---|---|---|---|
| | Standardized β | Standardized β | Standardized β | | |
| *Step 1: Demographic* | | | | | |
| Parent Race/Ethnicity | .02 | .04 | .22 | .999 | 1.001 |
| Parent Sex | -.13 | -.13 | -1.63 | .998 | 1.002 |

**Table 6** continued

| Predictor Variables | Model 1: Demographic Variables | Model 2: Demographic + Clinical Variables | Model 3: Demographic + Clinical + Psychosocial Variables | Tolerance | VIF |
|---|---|---|---|---|---|
| | Standardized β | Standardized β | Standardized β | | |
| Child Sex | .03 | .02 | -.23 | .999 | 1.001 |
| *Step 2: Clinical* | | | | | |
| CGM Use | | .17* | .19* | .985 | 1.015 |
| *Step 3: Psychosocial* | | | | | |
| HFS | | | .10 | .882 | 1.134 |
| PFS | | | -.06 | .776 | 1.288 |
| SPSI-R:S | | | -.27** | .745 | 1.342 |
| *Model Statistics* | | | | | |
| $R^2$ | 0.02 | 0.05 | .16 | | |
| $\Delta R^2$ | | 0.03 | .11 | | |
| F | 0.92 | 4.47 | 6.24 | | |
| p | 0.43 | 0.04* | .001** | | |

*p<.05 **p<.01

**Table 7: Regression Coefficients: BPFAS Problem Scale**

| Predictor Variables | Step 1: Demographic Variables | Step 2: Demographic + Clinical Variables | Step 3: Demographic + Clinical +Psychosocial Variables | Tolerance | VIF |
|---|---|---|---|---|---|
| | Standardized β | Standardized β | Standardized β | | |
| *Step 1: Demographic* | | | | | |
| Parent Race/Ethnicity | -.03 | -.01 | .01 | .999 | 1.001 |
| Parent Sex | -.07 | -.06 | .02 | .998 | 1.002 |
| Child Sex | .04 | .03 | -.01 | .999 | 1.001 |
| *Step 2: Clinical* | | | | | |
| CGM Use | | .22** | .25** | .985 | 1.015 |
| *Step 3: Psychosocial* | | | | | |
| HFS | | | .06 | .882 | 1.134 |
| PFS | | | -.04 | .776 | 1.288 |
| SPSI-R:S | | | -.32** | .745 | 1.342 |
| *Model Statistics* | | | | | |
| $R^2$ | .01 | .06 | .18 | | |
| $\Delta R^2$ | - | .05 | .13 | | |

**Table 7** continued

| Model Statistics | | | | | |
|---|---|---|---|---|---|
| F | .35 | 7.55 | 7.31 | | |
| p | .79 | .01** | .00** | | |

*p<.05 **p<.01

Partial regression plots and a plot of studentized residuals against the predicted values assessed and confirmed linearity. Plots of studentized residuals vs. unstandardized predicted values confirmed homoscedasticity. P-P Plots confirmed an assumption of normality for BPFAS Frequency Score, and a positive skew for BPFAS Problem Score. No adjustments were made for this positive skew.

For the BPFAS-Frequency regressions, the base model including only demographic variables did not have significant increases in frequency of problem parent behavior ($R^2$= .02, F(3,145)=.92, p>.05). The addition of the clinical variable CGM use to the demographic variables led to a significant increase in $R^2$ of .03, (F(1,144)= 4.47, p< .05. Finally, the addition of psychosocial variables led to a further increase in $R^2$ of .11. Thus, the full model including demographic variables (parent race/ethnicity, parent sex, child sex), clinical variable (CGM use), and psychosocial variables (HFS-Worry, PFS-Family Functioning, and SPSI scores) to predict BPFAS-Frequency score was statistically significant, with the complete model explaining 16% of the variance in BPFAS Frequency scores.

For the BPFAS-Problem regressions, the first model including only demographic variables was not related to parents' perceptions of whether their mealtime behaviors were problematic ($R^2$=.01, F(3,145)=.35, p>.05). The addition of CGM use to the demographic variables demonstrated a significant increase in $R^2$ of .05, F(1,144)=7.55, p<.01. Finally, the addition of the psychosocial variables resulted in a further significant increase in $R^2$ of .12. Thus, the full model of demographic variables (Parent Race/Ethnicity, Parent Sex, Child Sex), clinical variable (CGM Use) and psychosocial variables (HFS-Worry, PFS-Family Functioning, and SPSI) to predict number of BPFAS-Problem score was statistically significant, with the complete model explaining 18% (13% adjusted) of the variance in BPFAS Problem scores.

## 6. DISCUSSION

### 6.1. Summary

Use of CGM for T1D management and specific psychosocial factors in parents are associated with mealtime behaviors among parents of young children shortly after diagnosis. Specifically, these clinical and parent factors relate to how often parents engage in ineffective mealtime strategies to manage their child's behavior and how problematic they think their behavior is during mealtimes. Early parent interventions concentrating on mealtime management strategies and psychosocial contributors to mealtime stress may be important early in a young child's T1D diagnosis.

Together, parents' hypoglycemia worries, family communication and planning, and problem-solving skills accounted for most of the 16% of the variance in frequency of ineffective mealtime strategies. Though the total variance the model explains was relatively small overall, the psychosocial variables accounted for almost 75% of this variance. While significant, these findings are lower than other studies that have examined similar psychosocial correlates of parental stress and behaviors in parents with children with type 1 diabetes (Patton, Dolan, Smith, Thomas, & Powers, 2011; Mitchell et al., 2009). In the current model, psychosocial variables accounted for a large majority of the variance in both frequency and perception of mealtime management behaviors above and beyond CGM use, emphasizing the relative importance of psychosocial variables. The lower amount of overall variance in this study, when compared to studies examining other psychosocial variables, may be attributed to the fit of the current model (Patton et al., 2011). A more comprehensive model that includes other psychosocial

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variables, like parent stress and symptoms of anxiety and depression, may help to further explain increases in maladaptive parent mealtime management and mealtime perceptions. Other behavioral factors, like cultural mealtime practices or parent attitudes towards diabetes management, could also be associated with parent mealtime behavior.

These findings also expand on previous research about CGM use among young children. Early CGM adoption is associated with better health outcomes during the first year of diagnosis (Patton, Noser, Youngkin, Majidi, & Clements, 2019). The current study's examination of psychosocial factors within the first 2 months after T1D diagnosis reveals that families who have early CGM adoption may also be more likely to use problematic meal management strategies. Given the study design, we cannot determine the causal relation between these factors. Parents that have more worries about keeping glucose values in range and about their child's food intake may be more likely to use CGMs early. It is also possible that CGM use early on in diagnosis may also produce worries as the parent tries to interpret the volume of new data (Burckhardt et al., 2019; Patton & Clements, 2012; Hilliard et al., 2019).

**6.2. Parent Fear of Hypoglycemia and Mealtime Behavior**

This study's findings regarding the association between fear of hypoglycemia and parent problem mealtime behaviors suggests that parents that worried more about hypoglycemic events also engaged in more ineffective mealtime behaviors and held more negative perceptions about those behaviors. Worry surrounding hypoglycemia may relate to the rate and the content of the food that parents encourage their child to eat, and

experiences with children refusing food or not eating as expected may also make parents more afraid of their children experiencing hypoglycemia.

Parent behaviors like encouraging child self-regulation of hunger during meals, along with timing and choice limitations during meals, have been associated with favorable child growth  (Wood et al., 2020). Parents who are more worried about hypoglycemic events may be more likely to encourage their children to eat sugary or higher-carbohydrate foods regardless of hunger level, to reduce the risk of low blood glucose. Over consumption of sugar influences the neural food reward pathway, disrupting hunger cues, and leading to higher consumption of high carbohydrate foods. This ultimately may increase risk of binge eating behavior later in life such as during adolescence (Driscoll et al., 2017; Peterson et al., 2018; Treasure et al., 2015; Lutz, 2005). In early childhood, parents that worry more about low glucose values may also be more likely to engage in pressure to eat behaviors or "short order cooking" to keep blood glucose values in a certain range. This can interrupt a child's satiety cues, which can be associated with eating behaviors like binging and difficulty with weight management in adolescence (Driscoll et al., 2017). Flexible food choices and parent education on creative solutions to help meet carbohydrate consumption goals both can help the child navigate satiety cues (Peterson et al., 2018). Parent fear of hypoglycemia may be a relevant factor in addressing parent mealtime behavior and encouraging child self-regulation of hunger during meals.

**6.3. Family Functioning and Mealtime Behavior**

In this study, parents who reported talking about problems, listening to each other, and working together to solve problems less often were more likely to engage in ineffective mealtime behaviors frequently and to perceive their children's mealtime behaviors as more problematic. Parents in this study reported a low level of family functioning overall, (M=5.63, SD=1) comparable to a study with parents that recently experienced a wildfire (M=5.54, SD= .83) (Felix et al., 2015). This suggests that within a few weeks after their child's type 1 diabetes diagnosis, families appear to be experiencing impacts of high stress on the family system. A new type 1 diabetes diagnosis in a child can affect many aspects of the family system, such as increasing family conflict, stress, and communication (Rechenberg, Grey, & Sadler, 2017). Parents in this study reported low family functioning in the first month after T1D diagnosis and higher rates of maladaptive mealtime management. Family functioning has been a large area of study in child weight and feeding behaviors (Caccavale et al., 2015; Jewell, Blessitt, Stewart, Simic, & Eisler, 2016;), as well as type 1 diabetes management (Feldman et al., 2018; Mellin, Neumark-Sztainer, Patterson, & Sockalosky, 2004). The intersection of these studies indicates parent stress, problem solving, and communication tone/skill can be associated with type 1 diabetes management and child weight in populations with and without T1D (Westen et al., 2019; Feldman et al., 2018). This study adds to the need for parent and family support and during early diagnosis and provides more specific information on mealtime functioning.

## 6.4. Problem Solving and Mealtime Behavior

Problem solving had a significant negative correlation with BPFAS Frequency and Problem scales, such that weaker problem-solving skills were associated with more ineffective meal management and negative parent perception of their mealtime behaviors. Out of the psychosocial variables examined in this study, problem solving had the highest amount of variance accounted for out of the three psychosocial variables. Coping with a T1D diagnosis requires enhanced problem-solving skills for the management regimen (Pierce, Kozikowski, Lee, & Wysocki, 2017). When routines are new and skills are still developing, parents may become overwhelmed with child mealtime behavior, and participate in restriction or pressuring to eat more often. An intervention targeting parent management of picky mealtime behavior in youth (ages 8-17 years) with T1D found that parent problem solving training helped children maintain more balanced diets (Nansel et al., 2018). Mealtime synthesizes many challenging aspects of diabetes management, and improving problem solving skills may lead to more flexibility in child food choices and behaviors.

**6.5. CGM Use and Mealtime**

These findings also emphasize the importance of support for families who start using CGM very early after diagnosis, especially in relation to managing mealtimes in young children, a topic that has not yet been studied in this population. In other research with adoption of CGM in youth, CGM use has been associated with increased confidence in diabetes management, facilitating involvement of multiple caregivers and decreasing fingerstick blood glucose checks (Hilliard et al., 2019, Ng et al., 2019). Some research

indicates that CGM use may correlate with temporary increases in parent worry. In a study conducted by Van Name et al. (2017), parent worries about hypoglycemia were higher in parents with young children using CGMs compared to those that did not use CGMs. The authors explained the volume of data may increase parent worry, or those that seek out CGMs early in their child's diagnosis may have higher baseline worry. This increased worry, especially within a month post-diagnosis, may carry into mealtime and mealtime behavior management. This may explain the current study's findings of CGM users reporting more parent mealtime struggles and perceiving those struggles negatively. However, the cross-sectional nature of the current study cannot determine if the CGM itself leads to more problems at mealtime, or if parents that had lower family functioning, fear of hypoglycemia and lower problem-solving abilities were drawn to early CGM adoption.

### 6.6. Demographic Factors

No demographic factors were significantly associated with problem parent mealtime behavior in this sample, despite some evidence from other studies of gender differences and race/ethnicity differences in mealtime behavior and approaches to food in children without T1D (Borschuk & Everhart, 2015; Orrell-Valente et al., 2007; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). Previous studies in populations without T1D have found that pressure to eat behaviors and restriction were more common among parents in racial and ethnic minority groups, parents with less than a high school education and parents with lower household incomes (Loth et al., 2013). Also, there

have been sex differences in how parents treat children during mealtime, such as lower rates of encouraging to eat and using food rewards with girls (Lipowska, Lipowski, Jurek, Jankowska, & Pawlicka, 2018). Other studies have found Latinx/Hispanic families emphasize "cleaning the plate" and high mealtime structure, and Asian parents are more likely to restrict foods when compared to Non-Hispanic White families (Fiese, Hammons, & Grigsby-Toussaint, 2012; Kong et al., 2013; Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2013). However, there were no significant differences found in this study. These more culturally nuanced mealtime behaviors may emerge after adaptation to T1D diagnosis. Further mealtime studies with a lens on possible nuances of parent mealtime behavior across different races and ethnicities can help further describe the mealtime environment and lead to more culturally competent interventions and clinical care.

**6.7. Most Endorsed BPFAS Items**

The top endorsed items on the BPFAS Frequency Scale addressed "short order cooking", or serving food that differs from the family dinner, frustration or anxiety during mealtime, and pressuring to eat. The most frequent perceived problems related to frustration and anxiety at mealtime, pressuring to eat, and the child's diet in relation to child health. Parent behavior towards food can influence the way a child approaches and consumes food. Loth et al. examined directive control communication, practices where parent put external pressure on the child to eat a healthy diet and markers, including food restriction and pressure to eat. (Loth, Friend, Horning, Neumark-Sztainer, & Fulkerson, 2016). They found pressure-to-eat behaviors and other directive control measures were

not significantly related to dietary choices (Loth et al., 2016). In the current sample, the most endorsed behaviors were examples of directive (pressuring to eat) and non-directive communication (serving food different from the family), which have been shown to influence family functioning and mealtime affect in samples without T1D (Westen et al., 2019). These direct and indirect communications in families shortly after a child's T1D diagnosis require further research. It is possible that parent direct responses to mealtime stress, like "short order cooking", frustration, or restriction in early childhood and soon after T1D diagnosis could be adaptive short-term strategies to manage the acute stressors of the new diagnosis period, or it is possible that they could set the stage for the development of maladaptive strategies later in adolescence. Together, these early patterns have potential to influence their child's approach to food later in life, and further along in living with T1D.


## 6.8. Limitations

This study has limitations. One consideration with all research is the degree to which findings can generalize to the population of interest. In this study, the relatively high socio-economic status of participants (i.e., majority college-educated, privately insured) should be considered. Yet, the sample is much more diverse than many studies with children with type 1 diabetes populations. This study had only 62% non-Hispanic white participants, compared to many times over 90% non-Hispanic white participants in many studies in type 1 diabetes (Patton et al., 2008; Patton, Dolan, & Powers, 2008). Participants in this study were also recruited from hospitals serving large catchment

areas in two major metropolitan areas in separate regions of the country, further adding

to generalizability of the results. The current sample of 157 participants was

appropriately sized for the primary aim of evaluating the intervention using a

randomized clinical trial design. Additionally, this sample consisted of a high proportion

of mothers (91%).  While mothers are considered to be the primary caregiver more

often, more fathers could help generalize these findings in wider populations (Litchford,

Roskos, & Wengreen, 2020; Rahill, Kennedy, & Kearney, 2020)

This study used baseline data from an intervention study, which resulted in a

secondary analysis of cross-sectional data between psychosocial variables and parent

mealtime behavior. A longitudinal design may provide a better link to eating behaviors

later in childhood. Longitudinal research, however, requires high levels of grant

funding/resources, time, and participation from study sample. A longitudinal design

might better describe a link to later mealtime behaviors, but using secondary data can

deepen collected data, saving time for families, and maximizing the data's impact.

**6.9. Clinical Implications**

These findings emphasize the need for psychosocial support for parents early in their

child's type 1 diabetes diagnosis. An emphasis on mealtime interactions, and how to

navigate mealtimes with type 1 diabetes considerations, can help parents learn and

alleviate larger family functioning or problem-solving difficulties. Parents that also start

CGMs early in their child's diagnosis may benefit from some extra psychosocial support

to help them use the continuous glucose data effectively, without impacting psychosocial

outcomes, such as fear of hypoglycemia. Provider-led parent training around picky

eating and mealtime conflict with special considerations for type 1 diabetes management

is helpful for creating new routines and expectations and reducing anxiety and

frustration at mealtime. Conflict at mealtime, pressuring to eat, and directive

communication around food are associated with later issues with weight and eating

behaviors in adolescence (Driscoll et al., 2017; Horning et al., 2017; Loth, Friend,

Horning, Neumark-Sztainer, & Fulkerson, 2016; Pesch et al., 2016; Peterson et al.,

2018), so prevention efforts in these behaviors are important for future child functioning.

Regular meetings and contact with social workers and/or dieticians, with an emphasis on

problem solving towards snacks and mealtimes, can help to reduce conflict and increase

parent self-efficacy in engaging with their child.

## 6.10. Future Directions

Future areas of research include investigating other psychosocial factors that may be

associated with ineffective meal management. Parent depression, anxiety and overall

stress have also been found to relate to family functioning and the child's T1D

management (Patton, Dolan, Smith, Thomas, & Powers, 2011; Streisand, Swift,

Wickmark, Chen, & Holmes, 2005; Van Gampelaere et al., 2020). Examination of these

psychosocial factors may further explain mealtime functioning beyond this study. Also,

longitudinal studies are needed to help establish directionality of psychosocial

associations and the child's DEB through childhood and adolescence. Charting parent

and child mealtime behavior beginning at a type 1 diabetes diagnosis and continuing

through adolescence can establish a link between approaches at meal and snack time through childhood and scores on DEB measures later in life. These longitudinal links are needed to truly determine risk factors that predict adult behaviors towards food.

Continuing to learn about how CGM use affects parents at mealtimes also will be important to clinical care. As CGMs become even more widespread as a common approach to T1D management and become more financially accessible, extra training with a focus on mealtime could help with mealtime and diabetes management. The current study included families dealing with a recent T1D diagnosis, and so timing of this training may be key. When coping with a new diagnosis, routines, and tools, framing CGM data and utility at mealtimes may be beneficial for integration into family life.

## 6.11. Conclusion

The present study added to current conceptualizations of parent mealtime behaviors in a sensitive time shortly after their child's type 1 diabetes diagnosis. By better understanding the psychosocial correlates related to problem mealtime behavior can help to identify future intervention targets and in what areas parents need more support. Parent behaviors around food and mealtime can have lasting effects on how a child approaches food.

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