THE ROLE OF FAMILY FACTORS, ILLNESS-SPECIFIC YOUTH QUALITY OF LIFE AND PEDIATRIC PARENTING STRESS FOR YOUTH WITH POORLY CONTROLLED TYPE 1 DIABETES

by

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The Role of Family Factors, Illness-Specific Youth Quality of Life and Pediatric Parenting Stress for Youth with Poorly Controlled Type 1 Diabetes

Abstract

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Objective: The purpose of the study was to test interactive models that examined the moderating effects of diabetes-specific family conflict on the relationship between parental involvement in type 1 diabetes mellitus (T1DM) care and illness-specific psychosocial outcomes for youth in poor metabolic control and their parents. **Methods:** Youth (N=72) ages 10-18 years with poorly controlled diabetes (A1c >8.5%) and one parent/caregiver completed measures assessing parental involvement in T1DM care, family conflict, youth diabetes-specific quality of life, and pediatric parenting stress. **Results:** Low shared treatment responsibility between parent and youth for T1DM treatment tasks and high levels of diabetes-specific family conflict interacted to predict poorer youth and parent psychosocial outcomes. **Conclusions:** Interventions targeting both family sharing of treatment responsibility and family conflict about diabetes-related issues may foster improvements in youth diabetes-specific QOL and pediatric parenting stress.

The Role of Family Factors, Illness-Specific Youth Quality of Life and Pediatric Parenting Stress for Youth with Poorly Controlled Type 1 Diabetes

Diabetes mellitus ranks as one of the three most common chronic childhood diseases (Allen & Vessey, eds., 2004) with over 180,000 American youth under the age of 20 affected by the disease. The Centers for Disease Control and Prevention estimate that approximately 1 in every 400-600 youth have the more prevalent childhood form, type 1 diabetes mellitus (T1DM) (CDC, 2007). Along with their families, youth with T1DM encounter unique obstacles and risks related to their treatment regimen and specific to their illness (e.g., demanding daily tasks, medical complications, psychological risks). Thus, it is important to examine how family factors, such as parental support in disease management and family conflict about treatment-related tasks, impact both youth with T1DM and their parents.

Researchers have also suggested that a better understanding of illness-specific outcomes, which take into account the impact of these illness-specific parameters (e.g., symptom type and severity, treatment regimen demands) on psychological adjustment, may lead to the development of more tailored interventions better aimed at targeting the unique stressors and problems of populations with chronic illness (Thompson & Gustafson, 1996; Thompson, Gustafson, Gil, Godfrey, & Murphy, 1998). While a handful of studies have examined illness-specific psychosocial outcomes, such as diabetes-specific youth QOL (e.g., Hoey et al., 2001; Weissberg-Benchell et al., 2009) and pediatric parenting stress (Mitchell et al., 2009; Streisand, Swift, Wickmark, Chen, & Holmes, 2005), no study, to our knowledge, has investigated these illness-specific youth and parent outcomes in a T1DM sample of youth in poor metabolic control. Given the increased risks for poorer health and psychosocial outcomes amongst this population (Silverstein et al., 2005), it is important that attention also be given to the study of illness-specific psychosocial outcomes amongst this group of youth and their parents to better inform prevention and intervention work.

Guided by a family systems framework (Kazak, 1989), the purpose of this study was to examine interactions between diabetes-specific family conflict and measures of parental support in T1DM care (e.g., shared treatment responsibility and collaborative parent involvement) as they relate to illness-specific quality of life and pediatric parenting stress in a sample of youth with poorly controlled diabetes (see Figure 1 for a conceptual model). A family systems perspective takes into account the ramifications of the diagnosis on all family members and the ways in which these various effects impact others in the family (Kazak, 1989). The current research highlights the importance of examining common family challenges in caring for children with T1DM (e.g., family conflict about diabetes-related issues, managing the demanding treatment regimen) as they relate to both youth and parent psychosocial outcomes. Given the importance of family-centered care in pediatric medicine (Shelton, Jepson, & Johnson, 1987), this research is positioned to inform family-focused psychological interventions that can be integrated into multidisciplinary outpatient medical clinics.

Type 1 Diabetes Mellitus (T1DM)

Previously known as “insulin dependent” or “juvenile diabetes,” T1DM is often diagnosed before the age of 20 (National Institute of Diabetes and Digestive and Kidney Diseases, 2008). Symptoms include excessive urination and thirst, unexplained weight loss, hyperglycemia, and the excretion of glucose and ketones into the blood and urine

(Silverstein et al., 2005). T1DM is an autoimmune disease that attacks and destroys the insulin-producing beta cells of the pancreas. The pancreas then ceases to produce insulin, a chemical hormone that is critical to survival and needed to move glucose to the body's cells (Daneman, 2009; National Institute of Diabetes and Digestive and Kidney Diseases, 2008).

Unfortunately, there is currently no cure for T1DM. Therefore, despite demanding treatment regimens, appropriate daily disease management is essential (National Institute of Diabetes and Digestive and Kidney Diseases, 2008). It is generally recommended that youth with T1DM visit their healthcare providers four times annually (every three months) for glucose, cholesterol, and triglyceride tests, foot and dental exams, and weight and blood pressure checks. The day-to-day management of this disease is also critically important. Optimal daily TIDM management includes insulin injections or pump therapy, self-monitoring of blood glucose four to six times, nutritional meal planning, healthy eating, and physical exercise (Silverstein et al., 2005; Wysocki, Buckloh, & Greco, 2009). For adolescents with T1DM, the daily demands and accompanying stressors of disease management may lead to decreased adherence, with average adherence rates among youth with T1DM of approximately 50% (Osterberg & Blaschke, 2005). Others have reported nonadherence rates for blood glucose monitoring in children with T1DM ranging from 30% to 80% (Johnson, Pollak, Silverstein, Rosenbloom, Spillar et al., 1982; Kovacs, Goldston, Obrosky, & Iyengar, 1992). In addition to the medical complications associated with poor adherence (Silverstein et al., 2005), an increased risk for psychological problems may result (Hood, Huestis, Maher, Butler, Volkening, & Laffel, 2006; Goldston et al., 1997), Both the Diabetes Control and Complications Trial (DCCT) and follow-up Epidemiology of Diabetes Interventions and Complications (EDIC) study found that the healthy amounts of blood sugar in an individual's system (e.g., Hemoglobin A1c (A1c) levels of ~7%) contributed to significant health benefits, including the prevention or delaying of eye, kidney, and nerve damage due to diabetes (DCCT, 1993; EDIC, 2003). However, without strict adherence to the diabetes treatment regimen and the maintenance of optimal A1c levels, children with T1DM are at increased risk for a number of medical complications (Silverstein et al., 2005). Stunted growth, weight loss, delays in pubertal and skeletal maturation, and hyperglycemia can result from a lack of insulin. Conversely, children who overuse insulin may experience rapid weight gain and hypoglycemia (Silverstein et al., 2005). Hypoglycemia can lead to a number of additional T1DM complications, including cognitive impairments (e.g., associative learning, attention, mental flexibility, reaction time) and hypoglycemic seizures (Draelos et al., 1995). Chronic and more severe medical risks associated with T1DM include nephropathy (i.e., kidney disease), hypertension, dyslipidemia (i.e., high cholesterol), retinopathy, and impaired fertility. Potentially fatal complications of T1DM include diabetic ketoacidosis (DKA), a complication resulting from poor diabetes management or infection, and diabetic comas (National Institute of Diabetes and Digestive Kidney Diseases, 2008).

In addition to the many health risks and complications associated with T1DM, the treatment demands consequently contribute to increased stress and greater risk for psychological problems (Johnson, 1988; Wysocki et al., 2009; Goldston et al., 1997). Blanz and colleagues (1993) found a threefold increased risk of psychiatric disorders in their sample of 93 adolescents, ages 17-19 years, with T1DM when compared to a healthy matched-control group. Further support for this susceptibility to psychological problems is provided by the results of a 10-year longitudinal study of 92 youth with T1DM, ages 8-13 years, enrolled in the study upon initial T1DM diagnosis. Of the sample, an estimated 47.6% had experienced at least one psychiatric disorder with approximately 28% reporting major depressive or dysthymic disorder and an estimated 12% indicating some form of anxiety disorder (Kovacs, Goldston, Obrosky, & Bonar, 1997). Overall, when compared to similarly aged cohorts in the general population, Kovacs and colleagues (1997) concluded that youth with T1DM are at an elevated risk for psychiatric disorders. Hood and colleagues (2006) found that approximately one in seven youth with T1DM endorsed clinically significant depressive symptoms per self-report, nearly doubling the rates of the general population. Moreover, a tenfold increased incidence of suicidal ideation and suicide has been identified in adolescents with T1DM when compared to the general adolescent population (Goldston, Kovacs, Ho, Parrone, & Stiffler, 1994). Rates of eating disorders have also been found to be higher in youth with T1DM (Affenito & Adams, 2001; Polonsky et al., 1994) when compared to a healthy control group.

As noted, psychological outcomes associated with T1DM have been well studied and documented throughout the literature (e.g., Blanz et al., 1993; Hood et al., 2006; Kovacs et al., 1997). However, fewer studies have explored illness-specific psychological outcomes, especially within the context of poorly controlled T1DM. While psychological symptoms and problems may be detected in youth with T1DM through generic measures, diabetes-specific measures may better pinpoint the source of problems and guide directed intervention (Thompson & Gustafson, 1996). Moreover, as the family systems perspective (Kazak, 1989) purports, the entire family is affected by pediatric chronic illness; therefore, this study examined illness-specific psychosocial outcomes in both youth with T1DM and a parent/caregiver.

Psychosocial Outcomes

Diabetes-Specific Youth Quality of Life. Researchers have recognized the important role of health-related quality of life (QOL) when assessing the impact of diabetes and other chronic illnesses on a child (Grey, Boland, Yu, Sullivan-Bolyai, & Tamborlane, 1998). QOL is broadly defined as the subjective and objective impact of illness and treatment on one's physical, psychological, and social functioning (Spieth & Harris, 1996). QOL is often measured by asking respondents a number of questions that assess functioning across multiple domains (e.g., "How often does your diabetes interfere with your family life?" "How often do you feel physically ill?"; Diabetes Quality of Life Questionnaire - Youths; Ingersoll & Marrero, 1991). Over the past few decades, the study of QOL has become increasingly important due to research indicating the critical role psychosocial variables have on physical health outcomes and changes in health care delivery (Fallowfield, 1996; Rubin & Peyrot, 1999). Thus, current treatment management for youth with T1DM not only focuses on reaching metabolic goals, but also fostering a good QOL (Grey & Boland, 1996). QOL also plays an integral role in the development and evaluation of medical and psychological interventions (Sawyer et al., 2006; Varni, Limbers, & Burwinkle, 2007). For example, Grey and colleagues (2001) concluded that adolescents in poor metabolic control who report greater negative impact of diabetes on QOL are less likely to reach treatment goals. With the increasing attention being given to QOL, researchers have examined correlates of QOL for youth with

T1DM. These correlates include metabolic control (Guttmann-Bauman, Flaherty, Strugger, & McEvoy, 1998; Ingersoll & Marrero, 1991; Hoey et al., 2001; Vandagriff, Marrero, Ingersoll, & Fineberg, 1992), psychological adjustment (Grey et al., 1998), and parental involvement (Graue, Wentzel-Larsen, Hanestad, & Sovik, 2005; Laffel, Connell et al., 2003; Weissberg-Benchell,et al., 2009).

Generally, research suggests that youth with T1DM report their QOL to be good (Grey et al., 1998) or at least similar to healthy comparison groups (Laffel, Connell et al., 2003). However, as Grey and colleagues (1998) found in their study of 52 youth with T1DM, ages 13-20 years, those who reported a greater negative impact of diabetes on their QOL also indicated that diabetes management was more difficult, endorsed greater symptoms of depression, and indicated lower diabetes self-efficacy. Guttmann-Bauman and colleagues (1998) found that participants, ages 10-20 years, with better metabolic control reported better self-perceived QOL. The Hvidore Study Group on Childhood Diabetes included 2,101 youth, ages 10-18, with T1DM from 17 countries throughout the world (Hoey et al., 2001). Results indicated that lower A1c levels were associated with less negative impact of diabetes on QOL, fewer diabetes-related worries, greater life satisfaction, and better overall health perception (Hoey et al., 2001). However, other researchers have failed to find a significant relationship between QOL and metabolic control (Grey et al, 1998; Ingersoll & Marrero, 1991).

Studies exploring the relationship between youth QOL and parental involvement in care are inconsistent, with some showing no association between the two variables (Laffel, Connell et al., 2003; Weissberg-Benchell, et al., 2009) and others reporting a significant relationship (Graue et al., 2005). Laffel and colleagues (2003) used a generic

QOL measure, which allows for the assessment of common domains experienced by both healthy and illness-inflicted populations (Drotar, 1998; Quittner, Davis, & Modi, 2003), to explore the relationships between overall QOL and parental involvement in T1DM management among 100 participants, ages 8-17 years. Findings failed to support a significant association between parent and child report of both overall QOL and level of parental involvement in blood glucose monitoring or insulin injections. Similarly, Weissberg-Benchell and colleagues (2009) assessed both generic and diabetes-specific youth QOL and did not find a significant correlation between QOL measures and parental responsibility for T1DM treatment-related tasks. However, in a study of 115 adolescents with T1DM, ages 11-18 years, Graue and colleagues (2005) found that better health-related QOL and disease-specific QOL were significantly associated with higher perceptions of general parental care and involvement (i.e., not specific to parental involvement in T1DM management). The authors concluded that lower levels of general parental involvement could be a potential risk factor for decreased QOL in youth with T1DM. A potential moderating variable, unaccounted for in the previous studies, may explain some of the discordance between the study findings.

Pediatric Parenting Stress. Although T1DM puts a child at risk for increased psychosocial problems (for review, see Wysocki et al., 2009), the psychological implications of pediatric disease often affect the entire family unit (Jacobson et al., 1994; Kazak, 1989). Parents of children with T1DM must cope with the devastating news of their child's chronic illness, the associated medical risks, and the potential for a shortened life expectancy. Additionally, the responsibilities accompanying a demanding treatment regimen often induce a great deal of daily stressors (Kovacs et al., 1990). Given associations between stress and impaired judgment (Gillis, 1993), parenting stress may limit one's abilities to make illness-related decisions about the child's T1DM management (e.g., insulin adjustments). Parent stress has also been linked to poorer metabolic control (Stallwood, 2005) and poorer regimen adherence in youth with T1DM (Hanson, De Guire, Schinkel, & Kolterman, 1995).

Although studies have examined symptoms of psychopathology in parents of children with T1DM (e.g., Anderson & Auslander, 1980; Koski, 1969; Kovacs et al., 1990), less attention has been given to the daily stress that parents may experience. In a study of 40 children, ages 1-6 years, parents of children with T1DM reported higher stress levels than parents of controls (Powers et al., 2002). Hullman and colleagues' (2010) recent cross-illness examination found that while similar levels of general parenting stress were reported by parents of children with asthma, parents of children with T1DM reported greater general parenting stress than parents of children with cancer and parents of children with cystic fibrosis. Streisand and colleagues (2001) highlight the importance of examining pediatric parenting stress, which differs from general parent stress due to the focus on stress related to child health, parent responsibility for treatment regimens, parent burden, and parent adaption to illness, as it may better identify the source of parent stress. For example, it may be that parents of children with T1DM report greater stress when compared to parents of children with other pediatric conditions (Hullman et al., 2010) due to the daily demands of managing chronic T1DM. With a more detailed understanding of the origin of a parent's stress, targeted interventions can be delivered and treatment outcomes more precisely evaluated.

To date, few researchers have examined pediatric parenting stress in T1DM populations (Mitchell et al., 2009; Streisand et al., 2005) and despite the important role of parents in diabetes management, there has been limited research examining the relationship between family sharing of diabetes-related tasks and pediatric parenting stress. One exception is a study by Streisand and colleagues (2005) of 134 parents of children with T1DM, ages 9-17, which found that parents with greater treatment responsibility for managing their child's diabetes regimen experienced higher levels of pediatric parenting stress. Greater stress frequency and difficulties in managing stress were also associated with parents' lower self-efficacy for managing their child's diabetes and with greater parental fears of hypoglycemia.

Pediatric parenting stress and youth QOL are important outcomes of pediatric T1DM. Researchers have highlighted the potential modifiability of diabetes-specific family variables as targets of clinical intervention (Anderson, Brackett, Ho, & Laffel, 1999; Laffel, Vangness et al., 2003; Wysocki et al., 2006) to improve health and psychosocial outcomes. Anderson and colleagues (1999) note that maintaining parental involvement in pediatric T1DM management and reducing parent-child conflict are of critical importance when working with families of youth with T1DM. Despite the clinical relevance of these two variables, the interplay of parental involvement in T1DM care and diabetes-specific family conflict has not been examined in predicting youth and parent psychosocial outcomes.

Parental Involvement

Treatment Responsibility. Research has suggested that familial influences play a critical role in determining successful treatment adherence and T1DM care (for review, see Wysocki et al., 2009). Poor adherence and increased hospitalizations may result from parents giving developmentally inappropriate responsibilities for treatment management to their child (Wysocki et al., 1996). Treatment responsibility, often measured using the Diabetes Family Responsibility Questionnaire (DFRQ; Anderson, Auslander, Jung, Miller, & Santiago, 1990), assesses the division of responsibility for pediatric T1DM between family members. Treatment responsibility refers to the persons completing the treatment regimen tasks (e.g., remembering day of clinic appointment, deciding what to eat at meals of snacks, remembering times when blood sugar should be checked) and more specifically to whether those tasks are taken on by the parent, child, or both on a shared basis (Anderson et al., 1990).

The American Diabetes Association recommends that school-aged children begin assuming more responsibility for T1DM management. While the division in treatment responsibility is different for every family, shared care between parents and child is encouraged, with parental supervision emphasized, especially when the child is checking blood glucose or giving insulin injections (Silverstein et al., 2005). However, caution is warranted, as poorer metabolic control often results when too much independence has been given to the child (Fonagy, Moran, Lindsay, Kurtz, & Brown, 1987; Follansbee, 1989).

Adolescence is a time of immense change and accompanied by identity and independence struggles, peer pressure and conflict, and developmental, physical, and emotional maturation. A shift in treatment responsibility is most likely to occur during this time, with adolescents taking on more T1DM self-care behaviors (Silverstein et al., 2005). However, it is also during this time that a young person may put greater emphasis on their other activities (Helgeson et al., 2008). For that reason, while adolescents may have the capabilities to perform diabetes-related tasks independently, shared treatment responsibility is still recommended throughout the early teenager years, especially in making decisions regarding insulin adjustment (Silverstein et al., 2005). Studies have found that even throughout the teenage years, more parental guidance, supervision, and involvement in T1DM results in better diabetes management (Follansbee, 1989; Grey et al., 1998; Vesco et al., 2010).

Consistent with recommendations for increasing child/adolescent involvement in managing care, a number of studies have found that parents take primary responsibility for treatment tasks during childhood, with adolescents taking on more self-management tasks and engaging in shared tasks with the parents as they mature (Drotar & Ievers, 1994; Anderson, Ho, Brackett, Finkelstein, & Laffel, 1997; La Greca, Follansbee, & Skyler, 1990). Greater general adolescent independence in managing non-diabetes-related tasks is positively correlated with higher levels of youth responsibility in treatment-related tasks (Drotar & Ievers, 1994). However, adolescents reporting higher levels of treatment responsibility for their T1DM management are also more likely to report lower levels of diabetes-specific supportive parental behaviors (e.g., parental praise for treatment task completion) (Ott, Greening, Palardy, Holderby, & DeBell, 2000). Less parent support may be problematic because research has suggested that parental supervision and guidance of adolescent T1DM care leads to better health and psychosocial outcomes (Follansbee, 1989; Grey et al., 1998; Helgeson et al., 2008; Vesco et al., 2010).

Despite the supported significance of treatment responsibility in diabetes management, few researchers have explored the impact of shared treatment responsibility between youth and parent on psychosocial adjustment (Helgeson et al., 2008). One exception is a longitudinal study by Helgeson and colleagues (2008) that included 132 adolescents, ages 10-14 years at study start. Results indicated that child report of shared treatment responsibility was associated with less child depressive symptoms and less child anger. Moreover, both parent and child report of shared treatment responsibility were significantly associated with greater diabetes self-efficacy and better youth report of adherence. Age was found to interact with shared treatment responsibility such that older adolescents reporting lower shared treatment responsibility had poorer metabolic control (Helgeson et al., 2008).

Due to its important role in T1DM management, interventions have been designed to address treatment responsibility in care. For example, Anderson and colleagues (1999) designed an intervention study to improve parent-adolescent teamwork in diabetes management. Participants included 85 youth with T1DM, ages 10-15 years, and their parents. One strength of this study was the inclusion of three groups: a teamwork intervention condition that focused on the importance of parent-adolescent sharing of T1DM responsibility tasks, an attention control condition (i.e. didactic diabetes education with no focus on parental involvement), and a standard care condition. Along with sustained parental involvement in insulin injections over the 12-month study, families in the teamwork intervention condition reported significantly less family conflict when compared to both the attention control and standard care conditions. More adolescents in the teamwork group showed improvements in metabolic control when compared to the other groups (Anderson et al., 1999). Overall, the existing literature suggests that better child psychological and physical outcomes (e.g., less depression and anger, reduced family conflict, improved A1c, better QOL) may result from parents and youth sharing in the management of this chronic disease (e.g., Anderson et al., 1999; Graue et al., 2005; Helgeson et al., 2008).

Collaborative Parent Involvement. Recently, Palmer and colleagues (2011) determined that parental involvement in T1DM care is not a single construct; thus, assessment of parental involvement should include various, multidimensional measures. As discussed above, shared treatment responsibility may be critical during the adolescent years and also provides the opportunity for the modeling of good diabetes care. However, the under-involvement or over-control of parents may contribute to negative psychosocial and health outcomes, such as reduced youth QOL and poorer adherence (Wiebe et al., 2005). Therefore, researchers have suggested that it is important to consider the extent to which tasks are shared, but also the child's perception of the quality of parental involvement in care (Nansel et al., 2009). Consistent with this notion, in a study of 127 youth with T1DM, ages 10-15 years, Wiebe and colleagues (2005) found that better outcomes (e.g. adherence, hemoglobin A1c, diabetes-specific quality of life) were associated with adolescents' perceptions that their parents collaboratively shared in diabetes care activities. Collaborative parent involvement in diabetes management focuses on the quality of involvement, rather than the quantity of tasks completed by family members (Nansel et al., 2009), which is how treatment responsibility has typically been assessed. Collaboration involves joint decision making, negotiating, and problem solving (Berg, Meegan, & Deviney, 1998) with parents emphasizing and modeling behaviors that contribute to the development of the youth's independent diabetes management skills (Nansel et al., 2009). The Collaborative Parent Involvement Scale

(CPI; Nansel et al., 2009) is a newly developed measure used to assess youths' perceptions of parental collaboration in diabetes management (e.g., "I have a parent/guardian who helps me plan my diabetes care to fit my schedule," "I have a parent/guardian who knows when I need a little extra help with my diabetes").

Recent use of this measure highlights its promise for identifying collaborative parent involvement as an important aspect of T1DM care. Studies have found that collaborative parent involvement is a unique construct when compared to treatment responsibility. In a T1DM study of 122 youth ages 9-14 years collaborative parent involvement was not significantly associated with treatment responsibility, as measured by the DFRQ (Anderson et al., 1990), but was significantly correlated with diabetes-specific child QOL (Nansel et al., 2009). Nansel and colleagues (2009) suggested that collaborative parent involvement in diabetes management may be an important predictor of psychosocial outcomes. Consistent with this suggestion, in a study of 121 youth ages 9-14 years and their primary caregivers, Weissberg-Benchell and colleagues (2009) reported that better generic and diabetes-specific child QOL was related to child-reported collaborative parent involvement in T1DM management rather but not to measures of treatment responsibility.

Furthermore, child-report of collaborative parent involvement of primary and secondary caregivers was recently explored in a study of 309 participants with T1DM, ages 9-14 years (Wysocki et al., 2009). Based on the findings, Wysocki and colleagues (2009) suggested that youth reporting collaborative parent involvement above the median on the Collaborative Parent Involvement Scale (Nansel et al., 2009) for both their primary and secondary caregivers experience better outcomes, such as decreased depression, improved self-efficacy for diabetes management, and better generic and illness specific QOL. Study findings also revealed that when only one parent had high collaborative parent involvement, as reported by the child, more favorable outcomes resulted when it was the primary caregiver. Together, these findings suggest that youth who perceive low collaborative parent involvement in T1DM management are at increased risk for poor diabetes outcomes (Nansel et al., 2009; Weissberg-Benchell et al., 2009; Wysocki et al., 2009). Therefore, the quality of collaboration in diabetes management, which emphasizes parent involvement in problem-solving, consulting, and supporting their child in diabetes management, may be of unique importance to youth and parent psychosocial outcomes when compared to the extent to which one assumes responsibility for actual treatment regimen tasks (e.g., insulin injections). To better understand this, both shared responsibility between parent and youth for completing treatment regimen tasks and collaborative parent involvement need to be assessed.

Diabetes-Specific Family Conflict

As discussed earlier, health care delivery and disease management are increasingly being viewed within the context of the family system (Kazak, 1989). General family conflict (e.g., conflict not specific to diabetes) has a well-established association with youth T1DM adherence in both cross-sectional (Hanson, Henggeler, & Burghen, 1987) and longitudinal studies (Jacobson et al., 1990). In a study of 88 youth between the ages of 8-18 and their parents, Miller-Johnson and colleagues (1994) found a significant relationship between parent-child reports of general conflict (e.g., disagreement about manners) and diabetes management, suggesting that the demands of diabetes care often amplify general parent-child disagreement.

Although it is important to consider general family functioning, the examination of diabetes-specific family conflict can also be clinically informative when assessing psychosocial outcomes. General family conflict is often normal and at times can even be adaptive (Holmbeck, 1996). However, diabetes-specific conflict brings about a host of risks and often deters effective T1DM treatment management (Hood, Butler, Anderson, & Laffel, 2007). The Diabetes Family Conflict Scale – Revised (DFCS-R; Hood et al., 2007) is commonly used to measure diabetes-specific family conflict (e.g., "During the past month I have argued with my parent(s) about telling friends about diabetes"). The DFCS-R is positively correlated with negative affect around blood glucose monitoring and caregivers' perceived T1DM care burden, while negatively correlated with poorer child QOL (Hood et al., 2007).

Research also suggests that family conflict related to diabetes is associated with poor disease management. For example, Anderson and colleagues (2002) found that higher diabetes-specific family conflict contributed to poorer glycemic control in 104 youth, ages 8-17 years. Results from treatment studies suggest that diabetes-specific family conflict is a modifiable risk factor. Specifically, behavioral and psycho-educational interventions that included problem-solving and communicative skill-building have been effective in decreasing diabetes-specific family conflict (Anderson et al., 1999; Grey, Boland, Davidson, Li, & Tamborlane, 2000; Laffel, Vangness et al., 2003; Wysocki et al., 2000). For example, Behavioral Family Systems Therapy for Diabetes (BFST-D: Wysocki et al., 2006), which involves problem-solving and communication training to improve family communication and conflict resolution, has shown promise in reducing diabetes-specific family conflict and improving youth adherence to their treatment regimen.

Examining diabetes-specific family conflict may also shed light on factors related to psychosocial outcomes. For example, in a T1DM study involving 100 youth between the ages of 8-17 years, Laffel and colleagues (2003) found that greater diabetes-specific family conflict predicted poorer child generic QOL. Furthermore, a study using both generic and diabetes-specific QOL measures found that higher levels of diabetes-specific family conflict, as reported by both the child and parent, were significantly associated with poorer general and diabetes-specific child QOL (Weissberg-Benchell et al., 2009). As Laffel and colleagues (2003) suggested, family conflict related to T1DM management and care may have a greater effect on the child's QOL than the level of parental involvement in diabetes management. Alternatively, the interaction of family conflict and parental involvement in diabetes management may be critical in determining illness-specific psychosocial outcomes.

Value-Added Contribution

In summary, pediatric T1DM poses a number of risks and challenges for the entire family system. Diabetes-specific family variables impact health and psychosocial outcomes (e.g., Anderson et al., 1999; Anderson et al., 2002; Helgeson et al., 2008; Hood et al., 2007; Weissberg-Benchell et al., 2009), and researchers have identified parental involvement in T1DM care and family conflict as two family constructs of particular importance for promoting positive outcomes (Anderson et al., 1999). Researchers have examined associations between parental involvement in T1DM and diabetes-specific family conflict with both youth and parent psychosocial outcomes; however, interactions between parental involvement (e.g., family sharing of treatment-related responsibility and collaborative parental involvement) and diabetes-specific family conflict have not been explored. It may be that the positive effects of parental involvement in T1DM care will be different depending on the level of diabetes-specific family conflict. For example, parental involvement in T1DM care may have positive effects on psychosocial outcomes when family conflict is minimal. However, when there is a great deal of conflict related to T1DM management, parental involvement in T1DM care may not promote better outcomes.

By testing the potential moderating effects of diabetes-specific family conflict on the relationship between parental involvement in care (i.e., shared parent-youth responsibility for treatment tasks and collaborative parent involvement) and illness-specific youth and parent psychosocial outcomes, clinical practice may be better informed. For example, if families are experiencing high levels of conflict, a parent-youth teamwork approach to managing T1DM may only exacerbate conflict and contribute to poorer psychosocial outcomes. Family conflict could first be intervened upon before shared treatment responsibility is encouraged. Thus, by understanding the effects of diabetes-specific conflict, clinicians may be better equipped to help in the development of a family plan for managing pediatric T1DM that results in positive psychosocial outcomes for both the child and parent.

This study also adds to the literature on pediatric parenting stress in T1DM populations and its relation to family factors. The study of illness-specific psychosocial outcomes in the context of poorly controlled T1DM is an important contribution to the field, especially given the increased risk for psychological and medical problems in this population (Silverstein et al., 2005). Researchers have called for interventions aimed at targeting at-risk populations of youth with T1DM (Anderson et al., 1999). In response to this need, this research is positioned to better inform family-based interventions for youth in poor metabolic control. Research has also demonstrated the importance of shared responsibility between parents and youth for T1DM care with regards to both health and psychosocial outcomes (Anderson et al., 2002; Helgeson et al., 2008; Laffel, Vangsness et al., 2003); however, few studies have focused specifically on the degree to which tasks are shared between child/parent (Helgeson et al., 2008). This study adds to the literature by focusing specifically on shared treatment responsibility and its association with important diabetes-related constructs. Furthermore, to our knowledge, no studies have examined interactive models that account for the interplay between important family factors (e.g., shared treatment responsibility, collaborative parent involvement, diabetes-specific family conflict) in predicting illness-specific psychosocial outcomes.

Objectives

The primary goal of the study was to gain a better understanding of how diabetes-specific family conflict and parental involvement in diabetes care interact to predict illness-specific youth and parent psychosocial outcomes, particularly in a sample of youth with poorly controlled diabetes. Illness-specific psychosocial outcomes, diabetes-specific youth QOL and pediatric parenting stress, were examined. Parental involvement in diabetes care was investigated by examining both youth and parent report of shared treatment responsibility and collaborative parent involvement. Both youth and parent report of predictor variables were obtained due to the focus of this research on how pediatric T1DM impacts the entire family.

Hypotheses

Hypothesis 1

Based on previous findings (Laffel, Connell et al., 2003; Weissberg-Benchell et al., 2009), it was predicted that better youth-reported diabetes-specific QOL would be associated with lower levels of family conflict but not associated with child and parent report of shared treatment responsibility for T1DM treatment-related tasks. However, it was further hypothesized that the effect of shared treatment responsibility on youth QOL would vary with the level of diabetes-specific family conflict. The specific expectation was higher levels of treatment sharing would be positively related to youth QOL but only when family conflict was low.

Hypothesis 2

Considering the findings of Streisand and colleagues (2005), it was predicted that parent report of greater pediatric parenting stress would be negatively associated with child and parent report of shared treatment responsibility and positively associated with child and parent report of diabetes-specific family conflict. It was further hypothesized that the effect of shared treatment responsibility on pediatric parenting stress would vary depending on the level of family conflict. Specifically, it was expected that the positive effects of greater treatment sharing on pediatric parenting stress would be attenuated by high levels of family conflict.

Hypothesis 3

Based on the literature (Weissberg-Benchell et al., 2009; Wysocki et al., 2009), it was predicted that better youth-reported diabetes-specific QOL would be positively correlated with child and parent report of collaborative parent involvement in T1DM care and negatively correlated with child and report of diabetes-specific family conflict. It was further hypothesized that the effect of collaborative parent involvement on youth QOL would be moderated by varying levels of family conflict. It was expected that higher levels of collaborative parent involvement would be positively related to better youth QOL but only when family conflict was low.

Hypothesis 4

It was hypothesized that parent report of greater pediatric parenting stress would be negatively correlated with youth and parent report of collaborative parent involvement and positively correlated with youth and parent report of diabetes-specific family conflict. The effects of collaborative parent involvement on parenting stress were expected to vary with the level of family conflict. Specifically, it was expected that the positive effects of collaborative parent involvement on pediatric parenting stress would be attenuated at high levels of family conflict.

Method

Participants and Recruitment

The study sample was comprised of 72 youth ages 10-18 who had T1DM for at least 12 months and one parent/caregiver. The demographic and socioeconomic characteristics of youth-parent dyads are reported in Table 1. Participants were recruited from pediatric endocrinology clinics at University Hospitals Rainbow Babies and Children's Hospital, Cleveland, Ohio, to take part in an intensive clinic-based diabetes intervention program aimed at improving glycemic control in adolescents with poor metabolic control as determined at recruitment (recent A1c $\geq$ 8.5%) by serum hemoglobin A1c measurement. Taking into account youths' vulnerability to hypoglycemia, the American Diabetes Association recommends that children (6-12 years old) maintain an A1c of $\leq 8\%$ and adolescents (13-19 years old) maintain an A1c of $< 7.5\%$ (Silverstein et al., 2005). Therefore, across the pediatric T1DM literature, A1c levels of 8.5% - 9.0% are typically used as cut-off points for classifying poor metabolic control (e.g., Jackson, 2003; Raccah, 2009). Non-English speaking participants and those who had previously received psychological services to address adherence issues were excluded from the study.

The sample was recruited by mailing an introductory letter to the patients and families meeting inclusion criteria. Families indicating interest in the study were contacted via phone and in-person meetings were scheduled to provide a more detailed overview of the intervention study, which included information about the current study. The study was approved by University Hospitals IRB. Written youth assent and parent consent was obtained from all participants. Participants were given a unique study code number to protect confidentiality and privacy. All data was de-indentified and stored in locked file cabinets and password-protected files. Only IRB approved co-investigators and research assistants had access to data files.

Procedures

During the first of five visits to the intensive clinic-based diabetes intervention program, baseline information was collected. It was during this initial visit that the data for current study was obtained. In addition to the psychological and behavioral measures completed, demographic and socioeconomic information was also obtained. Both youth and parent participants completed separate packets of written questionnaires, which took approximately 35 minutes to complete. A glucose serum hemoglobin A1c test was also conducted on all youth participants during this initial visit. Youth participants received a $20 Target® gift card in compensation for completing the baseline measures.

Measures

Background Information Questionnaire. A questionnaire was developed by study investigators. Parents provided information about family demographics, socioeconomic status, parent educational history, and child medical history.

Diabetes Family Responsibility Questionnaire (DFRQ; Anderson et al., 1990). The DFRQ is a 17-item self-report measure, completed by both the child and parent, to assess the level of treatment responsibility assumed by family members in managing youth T1DM treatment regimen. Traditionally, items are scored along a 3-point ordinal scale, which includes 1 (“Child takes or initiates responsibility for this almost all of the time”), 2 (“Parent(s) and child share responsibility for this about equally”), and 3 (“Parent(s) takes or initiates responsibility for this almost all of the time”). Scores range from 17 (child has complete responsibility) to 51 (parent(s) has complete responsibility). More recently, researchers have begun to use a frequency or percentage of tasks in each column (1= Child responsibility, 2= Equal responsibility, 3= Parent responsibility) rather than the total score in order to gain a better understanding of how treatment responsibility is divided and shared (Helgeson et al., 2008). This scoring method provides a child responsibility score, a shared responsibility score, and a parent responsibility score. The shared responsibility score was used for regression analyses due to the importance of shared treatment responsibility for health and psychosocial outcomes (e.g., Anderson et al., 1999; Helgeson et al., 2008; Silverstein et al., 2005). Researchers have suggested that the examination of treatment responsibility without emphasis on how tasks were specifically distributed and/or shared by child, parent, or both may account for the null findings in previous research (Hegelson et al., 2008). Anderson and colleagues (1990) reported high internal consistency for both child ($\alpha = .84$) and parent ($\alpha = .85$) versions of the DFRQ total score. In the current study, Cronbach's alpha coefficients were good for both youth ($\alpha = .80$) and parent ($\alpha = .84$) report of shared responsibility. The DFRQ has also been shown to correlate (r = .21) with the Independence subscale of the Family Environment Scale (Moos & Moos, 1986), providing support for the construct validity of the measure (Anderson et al., 1990).

Collaborative Parent Involvement Scale (CPI; Nansel et al., 2009). The CPI is a 12-item measure assessing perceptions of collaborative parent involvement in diabetes management, as reported by the child along a 5-point Likert scale ranging from 1 ("Almost Never") to 5 ("Always"). This measure differs from the DFRQ (Anderson et al., 1990) in that it was designed to assess the quality of parental involvement in T1DM care versus how many treatment-related tasks the parent takes responsibility for. Scores range from 12 to 60, with higher scores suggesting greater collaborative parent involvement. Nansel and colleagues (2009) reported high internal consistency ($\alpha = .91$) for the total score. Associations were found with parenting style (responsiveness, r = .52; demandingness, r = .37) as measured by the Authoritative Parenting Index (Jackson, Henriksen, & Foshee, 1998), but not with parent treatment responsibility (r = -.02) as measured by the DFRQ (Anderson et al., 1990). Support for concurrent validity was evidenced by the pattern of significant associations with adherence (r = .25) and both generic (r = .43) and diabetes-specific (r = .36) child QOL (Nansel et al., 2009). An adapted parent version of the CPI was used for the current study to assess parent's own perceptions of their collaborative involvement in managing their child's T1DM. The scale was adapted by changing the wording of each item to reflect parent perceptions. For example, Item 1 was changed from "I have a parent who helps me plan my diabetes care to fit my schedule" to "I help plan my child's diabetes care to fit their schedule". A total sum score was used for the current study, with a Cronbach's alpha coefficient of .94 for the child version and .88 for the adapted parent version.

Diabetes Family Conflict Scale - Revised (revised DFCS-R; Hood et al., 2007). The DFCS-R was used to assess family conflict related to 19 diabetes-specific tasks, as reported by both the youth and parent. Items are scored along a 3-point Likert scale ranging from 1 ("Almost Never") to 3 ("Almost Always"). Scores range from 19 to 57, with higher scores indicating greater conflict. A total sum score was used. Hood and colleagues (2007) reported high internal consistency for both youth ($\alpha = .85$) and parent ($\alpha = .81$) responses. In the current study, high internal consistencies for youth ($\alpha = .94$) and parent ($\alpha = .84$) versions were also demonstrated. The DFCS-R has been found to be significantly correlated with similar constructs assessing negative affect around blood glucose monitoring ($r = .35$), poorer child QOL ($r = -.36$), and caregivers' perceived burden associated with diabetes management ($r = .45$) (Hood et al., 2007).

Diabetes Quality of Life Questionnaire - Youth (DQOLY; Ingersoll & Marrero, 1991). The DQOLY were used as an outcome measure to assess diabetes-specific youth (QOL). Initially developed by the DCCT research team (DCCT, 1993; EDIC, 2003) and later modified for child and adolescent use, the DQOLY is a child-reported 51-item measure of diabetes-specific youth QOL composed of three scales: Diabetes Life Satisfaction, Disease Impact, and Disease-Related Worries. The scale also includes a general self-rating of overall health. Researchers have used the Disease Impact scale in regression analyses, as it is highly intercorrelated with the other scales (Grey et al., 2001). The Disease Impact scale, which measures how often diabetes negatively impacts the child physically, psychologically, and socially, was used in analysis. All 23 items of the Disease Impact scale are scored along a 5-point Likert scale with scores ranging from 23 to 115. A summed score was used, with higher scores representing a greater negative impact of diabetes on QOL. High internal consistency (α = .83) for the Disease Impact Scale has been reported (Ingersoll & Marrero, 1991). The Cronbach's alpha for the Disease Impact scale in the current study was .83. The scale is referred to throughout the text as the negative impact of diabetes on youth QOL.

Pediatric Inventory for Parents (PIP; Streisand et al., 2001). The PIP was used as an outcome measure to assess illness-specific parenting stress. The PIP is a 42-item scale designed to measure self-reported parenting stress across four domains (communication, emotional distress, medical care, and role function). Parents rated both the frequency (i.e., Frequency subscale) of an event occurring and the difficulty (i.e., Difficulty subscale) of the event along a 5-point Likert scale. Scores range from 42 to 210 on each subscale. The subscales are combined to create a total pediatric parenting stress score, which can range from 84 to 420. Higher scores indicate greater parenting stress. The total scale score was used. High internal consistency (Cronbach α range: .80 - .96) has been reported (Streisand et al., 2001). In the current study, the Cronbach's alpha coefficient for the total scale was .96. Reliability was further documented in a study of mothers of children with T1DM (α = .97) (Lewin et al., 2005). Significant correlations between the PIP and similar measures of state anxiety and parent stress were found, providing some evidence for construct validity (Streisand et al., 2001).

Self Care Inventory - Revised (SCI-R; La Greca, Swales, Klemp, & Madigan, 1988). The SCI-R was used as a measure of youth T1DM adherence. The SCI-R is a 14-item self-reported questionnaire designed to measure the degree to which they adhere to diabetes self-care treatment recommendations in the past month. Items are scored along a 5-point Likert scale ranging from 1 ("Never do it") to 5 ("Always do this as recommended without fail"). Not applicable is also an option. Higher scores are representative of better adherence. A total sum score was used. High internal consistency (α = .80 or greater) has been reported in studies of children and adolescents (Davis et al., 2001; La Greca et al., 1995; Weinger, Butler, Welch, & La Greca, 2005). The Cronbach's alpha coefficient for the current study was .80. Delamater and colleagues (1997) reported a test-retest reliability of .77 over a 2-4 week time period. The SCI-R was shown to be significantly correlated with a longer measure of diabetes self-care behaviors (r = .63), providing some evidence for concurrent validity. Evidence for the construct validity of the SCI-R is provided by significant correlations with diabetes-related distress (r = -.36), self-esteem (r = .25), self-efficacy (r = .47), depression (r = -.22), anxiety (r = -.24), and A1c (r = -.37) (Weinger et al., 2005).

Positive and Negative Affect Schedule for Children (PANAS-C; Laurent et al., 1999). The PANAS-C is a 27-item measure designed to help differentiate symptoms of anxiety from symptoms of depression in children and adolescents composed of two subscales: Negative Affect scale (15 items) and Positive Affect scale (12 items). The Negative Affect subscale of the PANAS-C was used to control for general emotional distress in predicting youth QOL. Youth participants were asked to indicate how much they experienced a particular feeling or emotion over the past few weeks via a 5-point Likert scale ranging from 1 (“Not much or not at all”) to 5 (“A lot”). A sum score of each subscale was used, with higher scores representing greater positive or greater negative affect. Authors of the PANAS-C report alpha coefficients of .92-.94 for the Negative Affect scale and .89-.90 for the Positive Affect scale (Laurent et al., 1999). In the current study, Cronbach’s alpha coefficients were .86 for the Negative Affect scale and .91 for the Positive Affect scale. The Negative Affect scale has demonstrated significant positive correlations with the Children’s Depression Inventory (r = .59) (Kovacs, 1992) and State-Trait Anxiety Inventory for Children (r = .62) (Speilberger, 1973), providing support for convergent validity. A moderate negative correlation was detected between the Positive Affect scale and the depression measure (r = -.55) (Laurent, et al., 1999). These correlations are consistent with those reported using the adult version of the PANAS (Watson, Clark, & Tellegen, 1988).

Serum Hemoglobin A1c (A1c). A blood sample was collected to determine serum hemoglobin A1c, a measure of youth participants’ average blood sugar over the past three months. Results are reported as percentages.

Data Analysis

Statistical analyses were performed using the Statistical Software Package for the Social Sciences (SPSS, v. 19.0). Less than 1% of all data was missing due to non-response. Within-case mean imputation was used to compute scores in cases of missing item ratings (Little & Rubin, 2002). Summary statistics were used to describe the demographic characteristics of the sample. Independent-samples t-tests were used to compare youth and parent report of shared treatment responsibility, collaborative parent involvement, and diabetes-specific family conflict. Zero-order correlations were computed to examine associations between demographic and key study variables (see Tables 2 and 3). Youth age, parental education, family income, and race/ethnicity were not significantly correlated with the outcome variables (i.e., impact of diabetes on youth QOL and pediatric parenting stress), and thus, were not controlled for in regression analyses (see Table 2). Youth age was associated with shared treatment responsibility and collaborative parent involvement, but preliminary analyses revealed that it did not account for a significant proportion of variance in regression analyses. Therefore, it was not included as a covariate. T-tests did not reveal any differences between females (*M* = 54.14, *SD* = 13.34) or males (*M* = 51.36, *SD* = 10.19; t(70) = -.94, p = .35) in reporting the impact of diabetes on youth QOL, as measured by the Disease Impact scale of the DQOLY (Ingersoll & Marrero, 1991). Similarly, there were no differences between females (*M* = 186.11, *SD* = 46.69) or males (*M* = 175.89, *SD* = 58.07; t(70) = -.82, p = .41) on pediatric parenting stress; thus, youth gender was not controlled for in regression analyses. Consistent with previous research indicating an association between diabetes adherence and psychosocial outcomes (Goldston et al., 1997; Hood et al., 2006), adherence to treatment was significantly related to the impact of diabetes on youth QOL. To reduce the potential confound of adherence on dependent variables, and thus allow for more interpretable findings, the SCI-R (La Greca et al., 1988), was included as a covariate in all regression analyses. A1c was also included as a covariate in all regression analyses because of associations between youth metabolic control with both youth QOL (Guttmann-Bauman et al., 1998; Hoey et al., 2001) and parenting stress

(Auslander, Bubb, Rogge, & Santiago, 1993; Stallwood, 2005). To reduce potential confounding effects of general emotional distress on youth QOL, youth negative affect, as measured by the Negative Affect subscale of the PANAS-C (Laurent et al., 1999), was included as a covariate in models predicating youth QOL. Four participants did not complete the PANAS-C, as it had not yet been approved for use by the IRB at the time of data collection.

Prior to conducting regression analyses, univariate normality was assessed according to guidelines provided by West, Finch & Curran (1995) and all variables were found to be normally distributed. The guidelines provided by Aiken and West (1991) for testing interactions within hierarchical linear regression models were used to test the hypothesized moderating models. Independent variables were standardized to minimize multicollinearity. Covariates were entered in the first step (i.e., A1c, adherence, negative affect). Independent variables were entered in second step and interactions were entered in the third step. Regression diagnostics were examined. Examination of tolerance, variance inflation factor, and correlations between independent variables revealed that the assumption of multicollinearity was met for each regression analysis. Examination of Mahalanobis and Cook's distances failed to suggest multivariate outliers and the assumptions of linearity, multivariate normality, and homoscedascity were met according to examinations of the Normal Probability Plots (Tabachnick & Fidell, 2007). Post-hoc probing of significant interactions was conducted (Aiken & West, 1991; Holmbeck, 2002). A total of eight regression analyses were performed incorporating both youth and parent report.

Results

Participant Characteristics

Youth participants had a mean age of 14.2 years (*SD* = 2.9) with 61% of the sample female (refer to Table 1). Mean duration of diabetes amongst the sample was 6.3 years (*SD* = 3.4). Youth participants had a mean A1c of 10.2% (*SD* = 1.7). According to parent/caregiver report, approximately 68% of the sample was White, non-Hispanic and approximately 19% of the sample was Black. Over half of the sample reported a family income of less than $49,999. The majority of the sample reported that at least one parent completed some college or obtained a college degree.

Bivariate Analyses

Correlations between study variables can be found in Tables 2 and 3. As expected, a significant association between A1c and negative impact of diabetes on youth QOL was observed ($r = .30, p \leq .01$). Similar correlations were detected between adherence and diabetes-specific youth QOL, with poorer adherence associated with greater negative impact of diabetes on youth QOL ($r = -.34, p \leq .01$).

Although correlated ($r = .38, p \leq .01$), an independent-samples t-test revealed significant group differences between youth (*M* = 7.08, *SD* = 2.87) and parent (*M* = 8.25, *SD* = 2.80; t(142) = -2.47, *p* = .02) report of shared responsibility for treatment tasks, with parents reporting greater shared responsibility. Youth report of collaborative parent involvement (*M* = 45.7, *SD* = 12.5) and parents' self-reported collaborative involvement in T1DM care (*M* = 44.8, *SD* = 8.9; t(142) =.51, *p* = .61) were similar, as were youth (*M* = 29.89, *SD* = 9.58) and parent (*M* = 28.22, *SD* = 5.56; t(142) =.1.28, *p* = .203) report of diabetes-specific family conflict. With respect to the outcome variables, the impact of diabetes on youth QOL mean sample score was 53.06 (*SD* = 12.2). The mean total parenting stress score of the sample was 182.1 (*SD* = 51.3).

Multivariate Analyses

Hypothesis 1. Youth report of greater shared treatment responsibility was related to less negative impact of diabetes on youth QOL ($r = -.29, p \leq .05$). Parent report of shared treatment responsibility and youth and parent report of family conflict were not related to impact of diabetes on youth QOL (see Table 3). However, the interaction of youth report of shared treatment responsibility and youth report of family conflict was significant in predicting the impact of diabetes on youth QOL ($R^2 = .48$, $\Delta R^2 = .07$, $\Delta F(1,61) = 8.500, p = .005$). Main effects were also significant such that less shared treatment responsibility and greater family conflict accounted for significant portions of the variance in predicting poor QOL outcomes (refer to Table 4). As shown in Figure 2, the interaction suggests that the negative impact of diabetes on youth QOL is greatest when there is both low shared treatment responsibility sharing and high family conflict. Post-hoc probing revealed that simple slopes were significantly different from zero and the relationship is significant at both high and low levels of the moderator (i.e., diabetes-specific family conflict). Analysis failed to reveal an interaction effect between parent report of shared treatment responsibility and parent report of family conflict for youth QOL.

Hypothesis 2. As expected, greater pediatric parenting stress was associated with higher levels of family conflict as reported by both the child ($r = .27, p \leq .05$) and parent ($r = .60, p \leq .01$). Neither child or parent report of shared treatment responsibility were correlated with parent report of pediatric parenting stress (see Table 3). However, a significant interaction effect between youth report of equal treatment responsibility and youth report of family conflict was found for illness-specific parenting stress ($R^2 = .16$, $\Delta R^2 = .05$, $\Delta F(1,66) = 4.036$, $p = .049$). The interaction suggests that pediatric parenting stress is greatest at low levels of youth-reported shared treatment responsibility and high levels of youth-reported family conflict (Figure 3). Post-hoc analysis indicated that simple slopes were significantly different from zero and the relationship is significant at both high and low levels diabetes-specific family conflict. The combination of parent report of shared treatment responsibility and parent report of family conflict was not significant in predicting pediatric parenting stress. Both models revealed main effects for family conflict such that greater youth and parent report of diabetes-specific family conflict predicted higher levels of pediatric parenting stress (see Table 5).

Hypothesis 3. Impact of diabetes on youth QOL was negatively correlated with youth report of collaborative parent involvement ($r = -.24$, $p \leq .05$), but not with parent report of collaborative parent involvement (see Table 3). The interaction of youth report of collaborative parent involvement and youth report of family conflict was not significant in predicting impact of diabetes on youth QOL. Similarly, the interaction between parent report of collaborative parent involvement and parent report of family conflict was not a significant. Results failed to support the hypothesis that the positive effects of greater collaborative parent involvement were attenuated by greater family conflict. No main effects were detected (refer to Table 4).

Hypothesis 4. Pediatric parenting stress was not related to youth or parent report of collaborative parent involvement as hypothesized. Main effects were detected for youth report of collaborative parent involvement ($p \leq .05$) and both youth and parent report of diabetes-specific family conflict (*p* ≤ .01). Youth report of collaborative parent involvement predicted greater pediatric parenting stress. Greater diabetes-specific family conflict predicted higher levels of pediatric parenting stress (see Table 5). However, the interactive effects of collaborative parent involvement and family conflict were not significant in predicting pediatric parenting stress.

Discussion

Researchers have identified parental involvement in T1DM care and diabetes-specific family conflict as important targets for intervention, especially for at-risk populations of youth with T1DM (Anderson et al., 1999), such as those in poor metabolic control. However, to date, studies that have examined the interplay of these family variables could not be located. Given the significance of these family variables, an understanding of how the effects of parental involvement in care on youth and parent psychosocial outcomes may differ at varying levels of diabetes-specific family conflict may better facilitate the development and implementation of interventions for youth with T1DM and their families. The current study sought to fill this gap in the literature and provide a better understanding of illness-specific psychosocial outcomes for youth in poor metabolic control and their caregivers by testing interactive models that examined the moderating effects of family conflict on the relationship of shared treatment responsibility and collaborative parent involvement on outcomes.

The findings suggest that youth in poor metabolic control experience poorer diabetes-specific QOL when compared to previous examinations of youth in better metabolic control. In the current study, the sample mean for negative impact of diabetes on QOL was approximately two-times greater than the sample mean of nearly 2,000 participants ages 10-18 years who had a mean A1c of 8.7% (Hoey et al., 2001). Findings are consistent with conclusions made by Guttmann-Bauman and colleagues (1998) that youth in poorer metabolic control tend to rate diabetes-specific QOL lower than those in better metabolic control. Similarly, parents in the current study reported greater frequency and greater intensity of stress related to their child's condition when compared to a previous study by Streisand and colleagues (2005) of 134 parents of youth ages 9-17 years with a mean A1c of 8.5%. It is important to note that the participants in this study were enrolled in a larger intervention project that sought to improve glycemic control in this at-risk population via an intensive diabetes clinic that included psychological and dietary support and the use of a continuous glucose monitor. Thus, this treatment-seeking sample may represent a more distressed subset of the pediatric T1DM population; however, findings are still important since approximately 1/3 of adolescents with T1DM experience poor metabolic control (Kovacs et al., 1992) and assessment of this population is needed to better inform targeted interventions and assist in the allocation of limited healthcare resources.

Previous studies have not found significant associations between treatment responsibility for T1DM treatment-related tasks and better diabetes-specific youth QOL (Laffel, Connell et al., 2003; Weissberg-Benchell et al., 2009). However, the results of the current study indicated that youth-report of greater shared treatment responsibility was associated with less negative impact of diabetes on youth QOL. This finding is consistent with recommendations from the American Diabetes Associations and other researchers that sustained parental involvement in T1DM care is important for promoting optimal outcomes (e.g., Anderson et al., 1999; Anderson et al., 2002; Helgeson et al., 2008; Silverstein et al., 2005).

One of the most compelling results of this study was the finding that the positive effects of shared treatment responsibility on youth and parent psychosocial outcomes varied based on the degree to which a family experiences diabetes-specific family conflict, with the greatest negative impact of diabetes on QOL experienced by youth who reported both low levels of shared treatment responsibility and greater family conflict. This interaction effect may help to explain some of the inconsistent findings reported in the literature on the relation between parental involvement and youth QOL (Graue et al., 2005; Laffel et al., 2003; Weissberg-Benchell, et al., 2009). Although not hypothesized, findings further indicated that shared treatment responsibility may serve to buffer the effects of family conflict on negative diabetes-specific QOL outcomes. It could be that even though youth and parents engage in conflict about diabetes-related issues, youth still find it helpful that parents share in responsibility for the demanding treatment regimen. For example, an adolescent may argue with their parent(s) about bothersome reminders to check blood sugars or the need to disclose the diagnosis with friends, family, and teachers; however, given the daily demands and stressors associated with T1DM management, shared treatment responsibility is still important to the child's QOL. Low sharing of treatment responsibility may also reflect disengagement of parents from the diabetes management due to high conflict about diabetes related issues. Therefore, not only does the child have to assume responsibility for the treatment regimen independently, but also manage T1DM in a conflictual family environment.

Related to this, low sharing of treatment responsibility could also indicate that parents are assuming greater responsibility for disease management. Study findings indicated that youth report of greater parent responsibility for managing diabetes-related tasks was associated with greater negative impact of diabetes on youth QOL. Study findings complement the literature that has reported associations between greater parent responsibility for T1DM care and negative psychosocial outcomes, such as poorer youth social competence and less diabetes-specific self-efficacy (Helgeson et al., 2008). Similarly, findings are related to those of Wiebe and colleagues (2005) that determined maternal control (i.e., intrusive control of pediatric T1DM-related issues) was associated with poorer adherence in older children with T1DM and reduced quality of life in females. In accordance with general child development literature (Pomerantz & Eaton, 2000), it may be that a lack of shared responsibility contributes to a reduced diabetes-specific QOL as children may feel their parents view them as incompetent in managing their diabetes when the parent takes on too much of the responsibility. Therefore, while parental involvement in care is important, findings highlight the significance of youth and parents sharing responsibility for treatment-related tasks (e.g., insulin injections, blood glucose checks), rather than the parent taking all responsibility for treatment regimen management.

As expected, greater diabetes-specific family conflict was related to higher levels of pediatric parenting stress. Furthermore, pediatric parenting stress was also found to be greatest at low levels of youth-reported shared treatment responsibility and high levels of youth-reported diabetes-specific family conflict. Pediatric parenting stress was lowest when diabetes-specific family conflict was minimal and shared treatment responsibility was low. Others have suggested that greater parental responsibility for treatment-related tasks is associated with greater pediatric parenting stress (Streisand et al., 2005). It could be that parent responsibility for tasks is viewed by the child as “miscarried helping” or excessive and inappropriate (Anderson, 1991), which in turn, leads to greater family conflict (Anderson et al., 1999). Results further suggest that when parents and youth are in frequent conflict about diabetes-related issues, a lack of shared responsibility may actually induce greater stress for the parent. For example, family conflict about giving shots, logging blood sugar results, or making smart mealtime decisions may induce stress on the parent. In addition to this conflict, when the parent does not share in managing treatment-related tasks, it may bring about greater stress, as the parent may worry more about their child and associated consequences of poor diabetes management. Conversely, when the parent takes on too much responsibility, the child may view this as overcontrolling or the parent may find themselves overwhelmed by the demands of T1DM management.

Of note, interaction effects were not significant for parent report on measures. Helgeson and colleagues (2008) found that child report of shared responsibility was associated with better psychosocial youth outcomes, whereas parent report of shared responsibility was not. The current study findings are similar. It may be that youth have a better understanding of how responsibility for treatment-related tasks is shared and divided. Since parents reported significantly higher levels of shared treatment responsibility, it could represent parent bias in overestimating their own involvement in T1DM care. Also contrary to hypotheses, interaction effects between collaborative parent involvement and diabetes-specific family conflict did not predict outcomes. Given the novelty of the construct of collaborative parent involvement and the measurement tool, it could be that there are important variables associated with this construct that have yet to be identified by the literature, and therefore, not included in the interactive models.

Strengths

The current study has a number of strengths. A heterogeneous sample of participants was recruited, with over 30% of the sample representing minority groups. Thus, the results are likely to generalize to diverse T1DM populations in poor metabolic control. Furthermore, given that large studies have found mean A1cs of adolescent samples to be generally greater than 8.0% (i.e., above the recommended level), results may also apply to the general adolescent T1DM population given how common poor metabolic control is amongst this population (Kovacs et al., 1992; Mortensen et al., 1998). However, research with a clinic sample that includes youth in all ranges of metabolic control is needed to support this claim. Additionally, consistent with a family systems approach (Kazak, 1989) both youth and parent report on most measures was obtained, which allowed for the assessment of diabetes-related family factors according to both youth and parent perspectives. Furthermore, the study's overall focus on diabetes-specific outcomes is an important contribution to the literature. As Thompson and Gustafson (1996) have indicated, an understanding of illness-specific outcomes may better inform intervention, as clinicians are likely better positioned to identify the stressors and problems. To our knowledge, this was also the first study to examine the interplay of diabetes-specific family factors in predicting diabetes-specific youth QOL and pediatric parenting stress.

Methodologically, this study makes a number of contributions to the literature. First, treatment responsibility was assessed based on the extent to which youth and parents reported shared (i.e., equal) responsibility on the DFRQ (Anderson et al., 1990) rather than on the degree of parent responsibility (traditionally scored as the sum of ratings across treatment-related tasks, with child responsibility receiving 1 point, shared responsibility receiving 2 points, and parent responsibility receiving 3 points). As Helgeson and colleagues (2008) noted, other studies may have failed to detect significant relationships between treatment responsibility and various factors due to use of the total score. Shared responsibility between parents and youth is often recommended (Silverstein et al., 2005) as research has demonstrated important links between parental involvement in care and better health and psychosocial outcomes (Anderson et al., 1999; Anderson et al., 2002; Helgeson et al., 2008; Laffel, Vangsness et al., 2003). However, a total sum score may not be the best indicator of the degree to which responsibility is shared. For example, one respondent may report that 50% of the tasks are managed by the child only (1 point each), while the other half is managed by the parent only (3 points each). Another respondent may indicate that nearly all tasks are shared equally between parent and child (2 points each). Despite the important differences in how responsibility is managed between these two respondents, the total sum score of both respondents would be similar. The current findings and the results of Helgeson and colleagues (2008) suggest that a better understanding of the division of treatment responsibility may be gained by examining the number of tasks carried out by the child, the parent, and both the parent and child.

Additional methodological contributions to the literature include use of the relatively new CPI (Nansel et al., 2009) measure and adapted parent version in order to assess parent-report of their collaborative involvement in their child's diabetes management. Both the youth version and adapted parent version of the scale demonstrated high internal consistency. Exploratory examination of significant correlations between the CPI and other measures revealed important findings and add to the literature regarding the psychometric properties of this new instrument. Furthermore, this was the first study to use the CPI (Nansel et al., 2009) with a sample that included older adolescents and was representative of diverse racial/ethnic groups.

Limitations

While focusing on youth with diabetes under poor metabolic control was useful in examining the associations of family factors with parent and youth outcomes in this high-risk segment of the population, exclusion of a broader range of youth with diabetes is also a study limitation as the findings may not generalize to youth in good metabolic control and their parents. An additional limitation was that the pool of participants eligible for the study was considerably smaller due to study restrictions regarding metabolic control. The small sample size, which limited statistical power, prevented the testing of three-way interactions that included age and the controlling of demographics. Given the well-documented association between age and greater youth responsibility for T1DM management (e.g., Anderson et al., 1990; Anderson et al., 2002; Drotar & Ievers, 1994; Ott et al., 2000; Wysocki et al., 1996), future research should expand upon the findings by testing a three-way interaction that includes age, parental involvement in care, and family conflict with a larger sample of youth in all ranges of metabolic control.

Additionally, only one parent/caregiver was recruited to participate in the study. Similarly to most pediatric psychology research (Phares, Lopez, Fields, Kamboukos, & Duhig, 2005), parent respondents were mostly mothers, limiting our understanding of pediatric parenting stress in other caregivers.

Additionally, despite the benefits of the illness-specific focus of this research discussed earlier, there are limitations to this approach as Varni and colleagues (2001) proposed that there are benefits to including both generic and illness-specific measures. Generic measures allow for the assessment of more common domains and help researchers to understand possible differences and similarities between youth with T1DM and healthy children. Additionally, non-diabetes specific variables are also important to psychosocial and health outcomes. For example, future research may consider testing interaction effects in predicting non-diabetes specific psychosocial outcomes (e.g., depression, anxiety). It is also important to note that use of the adapted parent version of the CPI (Nansel et al., 2009) could also be considered a limitation of the current study and explain why few significant results were detected using this measure. Evidence is lacking for the psychometric properties of the adapted version. Given the novelty of the measure, additional research using both youth and adapted parent versions of the CPI (Nansel et al., 2009) is needed to provide a better understanding of what collaborative parent involvement is, how it is related to other important constructs, and provide additional support for the reliability and validity of the measure.

Finally, the cross-sectional nature of this research limits our ability to make causal interpretations. While this study hypothesized diabetes-specific family conflict to be the moderating variable, it may also be that the opposite is true and shared treatment responsibility is acting as the moderator. For example, high family conflict may be negatively associated with psychosocial outcomes when shared treatment responsibility is low because parents and youth are arguing a great deal about who should be taking responsibility, how one manages treatment-related tasks, and the lack of working together to manage T1DM appropriately. Longitudinal analysis that includes assessment of predictor and outcome variables, especially during times of transition in responsibility for T1DM care, could provide a better understanding of causal relationships and information about time points in which intervention may be most critical.

Clinical Implications

Clinically, this research informs intervention and provides support for the involvement of psychologists as members of multidisciplinary pediatric endocrinology teams. A family-centered model of care is important to pediatric T1DM care (Hanson et al., 1995). Family-focused interventions have demonstrated success in improving parental involvement in T1DM care (Anderson et al., 1999; Laffel, Vangsness, et al., 2003) and reducing family conflict (Anderson et al., 1999; Wysocki et al., 1996). Paired with the intervention literature, results suggest that family-based interventions that target both conflict related to T1DM and family sharing of treatment responsibility may foster improvements in psychosocial outcomes, such as diabetes-specific youth QOL and pediatric parenting stress.

Given the brevity of assessment measures that assess these family constructs, clinicians may consider integrating such tools into standard diabetes clinic visits. These measures can provide valuable information that can be of assistance to clinicians when helping youth and parents negotiate treatment plans. For example, if the interaction effects determined in the current study reflect disengagement of youth or parents from diabetes management due to high family conflict, then these families may benefit from intervention that targets family conflict first. Interaction findings also indicate potential buffering effects of higher levels of shared treatment responsibility. This also has important implications for clinical work as it highlights the significance of encouraging family members to work together to manage T1DM, even in circumstances where family conflict is present. Clinicians could gain a better understanding of how responsibility is currently being distributed and help the youth and parent/caregiver problem solve ways in which the responsibility for treatment-related tasks can be shared evenly, as researchers have demonstrated the effectiveness of targeting problem-solving skills in an effort to improve outcomes (Wysocki et al., 2006).

To date, family-based interventions have sought to improve youth outcomes by targeting family variables (e.g., parental involvement in T1DM care, family conflict). The current study highlights possible opportunities for intervention to also improve parent/caregiver outcomes since pediatric T1DM has implications for the entire family system (Jacobson et al., 1994; Kazak, 1989). Previous research has demonstrated links between parenting stress and poorer youth metabolic control (Stallwood, 2005) and adherence (Hanson et al., 1995); thus, reducing pediatric parenting stress may also have positive effects on youth outcomes. Specifically, results of the current study highlight the importance of intervening upon diabetes-specific family conflict as a potential means for reducing pediatric parenting stress. Parents may be cognizant of the importance of their sustained involvement in their child’s T1DM care; however, if high levels of family conflict are present, parents may find that their continued involvement in managing treatment-related tasks is contributing to increased stress. Thus, when promoting and encouraging shared treatment responsibility and sustained parental involvement in care, it is also important that diabetes-related family conflicts be addressed and resolved.

Future Directions

Although support for family-based interventions with pediatric T1DM populations has been demonstrated (Anderson et al., 1999; Laffel, Vangsness, et al., 2003; Wysocki et al., 2006), time and resource restraints may limit the feasibility of such interventions. It may be possible that components of these interventions, such as problem-solving training and didactics, be integrated into internet-delivered interventions to target both family sharing of treatment-related tasks and diabetes-specific family conflict. Internet-delivered interventions for pediatric populations have shown great promise and the field has called for continued investigation of such interventions (Ritterband & Palermo, 2009). Additionally, internet-based interventions for adults with type 2 diabetes have demonstrated success (Barrera, Glasgow, Mckay, Boles, & Feil, 2002; McKay, Glasgow, Feil, Boles, & Barrera, 2002). Future research is needed to determine the effectiveness and efficacy of internet interventions for pediatric T1DM populations.

Additionally, future investigations should seek to examine the interplay of shared treatment responsibility and diabetes-specific family conflict in predicting health outcomes, such as adherence. Results of this study suggest that better diabetes-specific psychosocial outcomes for both youth with T1DM and their parents may result from targeting family variables, especially in the context of poor metabolic control. It may also be that shared treatment responsibility and family conflict interact to predict adherence. For example, the combination of high shared treatment responsibility and low family conflict may be associated with better adherence. Future research is needed to understand this as it would provide additional support for the benefits of intervening upon these two family variables.

As noted, future longitudinal research is needed. Given the established importance of shared treatment responsibility and parental involvement in T1DM care (Anderson et al., 1999; Anderson et al., 2002; Helgeson et al., 2008; Laffel, Vangsness et al., 2003; Silverstein et al., 2005), the field would likely benefit from a longitudinal investigation that seeks to better understand how parental involvement in T1DM interacts with important diabetes-related variables (e.g., family conflict, self-efficacy, diabetes knowledge) throughout child development to predict both health and psychosocial outcomes. This information would provide clinicians with information about time points in which intervention may be most critical. Investigators would also gain a better understanding of causality, which would better inform the design and implementation of interventions.

In conclusion, this study adds to the pediatric T1DM literature that has established parental involvement in T1DM care and family conflict as two variables of significance by testing the interaction effects of these variables on youth diabetes-specific QOL and pediatric parenting stress, specifically in the context of poor metabolic control. In addition to informing interventions, this research provides additional support for the importance of shared treatment responsibility between youth and parents for managing treatment-related tasks. Overall, this study adds to the literature on diabetes-specific variables and outcomes and provides a much-needed assessment of youth in poor metabolic control and their parents, a population in need of targeted intervention.

Table 1

Demographic Characteristics of Participants

Characteristic	N = 72	
Mean Youth Age (SD)	14.2	(2.4)
Mean A1c (SD)	10.2	(1.8)
Mean Years Since Diagnosis (SD)	6.3	(3.4)
Youth Sex (%)		
Female	44	(61.1)
Male	28	(38.9)
Parent/Caregiver Respondent (%)		
Mother	55	(76.4)
Father	12	(16.7)
Other	5	(6.9)
Family Race/Ethnicity (%)		
White, non-Hispanic	49	(68.1)
Black	14	(19.4)
Hispanic/Latino	1	(1.4)
Bi/Multi-Racial	8	(11.1)
Family Income[a]		
<$24,999	24	(34.3)
$25,000-$74,999	30	(42.9)
$75,000-$149,999	11	(15.7)
>$150,000	5	(7.1)
Parent Education (%)		
Some High School	3	(4.2)
High School	14	(19.4)
Some College	31	(43.1)
College Degree	21	(29.2)
Some Graduate School	1	(1.4)
Graduate School Degree	2	(2.8)
Family Structure (%)		
Married	36	(50.0)
Single Mother	19	(26.4)
Single Father	4	(5.6)
Mixed Family	10	(13.9)
Grandparents	2	(2.8)
Other	1	(1.4)

[a] Two families did not to respond. N = 70.

Table 2

Correlations between Demographic Characteristics and Outcome Variables

Variable	1	2	3	4	5	6	7
1. Youth Age	-----						
2. Youth Sex	-.21	-----					
3. Family Race/ Ethnicity	.08	.09	-----				
4. Family Income	.08	.23	.08	-----			
5. Parent Education	.02	.07	.04	.22	-----		
6. DQOLY (Imp)	.08	.11	.15	.13	-.08	-----	
7. PIP	.10	.10	-.05	-.04	-.03	.04	-----

Note. DQOLY (Imp) = Diabetes Quality of Life Questionnaire – Youth (Impact Subscale); PIP = Pediatric Inventory for Parents

* $p \leq .05$

**$p \leq .01$

Table 3

Correlations, Means, and Standard Deviations of Key Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	M	SD
1. A1c	----												10.2	1.8
2. SCI-R	-.29*	----											48.3	9.5
3. PANAS-C (NA)	.28*	-.30*	----										29.5	8.8
4. PANAS-C (PA)	-.20	.33**	-.15	----									42.2	9.9
5. DFRQ – EQ (Y)	-.22	.24*	-.02	.29*	----								7.1	2.9
6. DFRQ – EQ (P)	-.16	-.22	-.22	.00	.38**	----							8.3	2.8
7. CPI (Y)	-.21	.41**	-.27*	.41**	.41**	.15	----						45.7	12.5
8. CPI (P)	-.17	.14	-.08	.09	.03	.17	.39**	----					44.8	8.9
9. DFCS-R (Y)	-.04	-.13	-.03	-.05	.09	.05	-.07	-.04	----				29.9	9.6
10. DFCS-R (P)	.22	-.09	.17	-.06	.24*	-.02	.12	-.08	.16	----			28.2	5.6
11. DQOLY (Imp)	.30**	-.34**	.51**	-.24	-.29*	-.16	-.24*	.13	.21	.20	----		53.1	12.2
12. PIP	.18	-.01	.03	.11	.15	-.04	.18	.03	.27*	.60**	.04	----	182.1	51.3

Note. SCI-R = Self Care Inventory – Revised; PANAS-C (PA) = Positive and Negative Affect Schedule for Children (Negative Affect Subscale); PANAS-C (NA) = Positive and Negative Affect Schedule for Children (Positive Affect Subscale); DFRQ – EQ (Y) = Diabetes Family Responsibility Questionnaire – Equal Responsibility (Youth Report); DFRQ – EQ (P) = Diabetes Family Responsibility Questionnaire – Equal Responsibility (Parent Report); CPI (Y) = Collaborative Parent Involvement (Youth Report); CPI (P) = Collaborative Parent Involvement (Parent Report); DFCS-R (Y) = Diabetes Family Conflict Scale – Revised (Youth Report); DFCS-R (P) = Diabetes Family Conflict Scale – Revised (Parent Report); DQOLY (Imp) = Diabetes Quality of Life Questionnaire – Youth (Impact Subscale); PIP = Pediatric Inventory for Parents

* $p \leq .05$

**$p \leq .01$

Table 4

Hierarchical Linear Regressions Predicting Impact of Diabetes on Youth Quality of Life

Model	Predictor	R^2	*F*	ΔR^2	ΔF	*B (SE)*	β	*t*	95% CI for *B*
Equal TR (Y) x Family Conflict (Y)	Step 1	.32	10.35^{**}	.33	10.35^{**}				
	A1c					.95 (.71)	.14	1.35	[-.46, 2.37]
	Adherence					.01 (.13)	.00	.04	[-.26, .27]
	Negative Affect					$.63\ (.14)^{**}$	.46	4.64	[.36, .90]
	Step 2	.41	8.67^{**}	.09	4.46^{*}				
	Equal TR					$-3.95\ (1.27)^{**}$	-.32	-3.11	[-6.49, -1.41]
	Family Conflict					$3.92\ (1.21)^{**}$	.33	3.25	[1.51, 6.34]
	Step 3	.48	9.51^{**}	.07	8.50^{**}				
	Equal TR x Family Conflict					$-3.67\ (1.26)^{*}$	-.30	-2.92	[-6.19, -1.15]
Equal TR (P) x Family Conflict (P)	Step 1	.33	10.35^{**}	.33	10.35^{**}				
	A1c					1.14 (.81)	.17	1.42	[-.47, 2.76]
	Adherence					-.17 (.14)	-.14	-1.24	[-.45, .11]
	Negative Affect					$.56\ (.15)^{**}$	.41	3.60	[.25, .87]
	Step 2	.33	6.17^{**}	.01	.25				
	Equal TR					-.21 (1.46)	-.02	-.15	[-3.13, 2.71]
	Family Conflict					.83 (1.37)	.07	.61	[-1.90, 3.56]
	Step 3	.35	5.44^{**}	.02	1.52				
	Equal TR x Family Conflict					-1.76 (1.43)	-.14	-1.23	[-4.61, 1.09]
CPI (Y) x Family Conflict (Y)	Step 1	.33	10.35^{**}	.33	10.35^{**}				
	A1c					1.39 (.76)	.20	1.83	[-.13, 2.92]
	Adherence					.01 (.13)	-.09	-.78	[-.41 .18]
	Negative Affect					$.57\ (.15)^{**}$	.42	3.77	[.27, .87]
	Step 2	.36	7.07^{**}	.04	1.78				
	CPI					-.84 (1.40)	-.07	-.60	[-3.63, 1.95]
	Family Conflict					2.13 (1.23)	.18	1.74	[-.32, 4.59]
	Step 3	.36	5.82^{**}	.00	.08				
	CPI x Family Conflict					-.38 (1.33)	-.03	-.28	[-3.03, 2.28]
CPI (P) x Family Conflict (P)	Step 1	.33	10.35^{**}	.33	10.35^{**}				
	A1c					1.33 (.80)	.19	1.67	[-.26, 2.93]
	Adherence					-.20 (.14)	-.16	-1.43	[-.47, .08]
	Negative Affect					$.56\ (.15)^{**}$	.41	3.76	[.26, .86]
	Step 2	.37	7.11^{**}	.04	1.85				
	CPI					2.22 (1.26)	.18	1.76	[-.30, 4.75]
	Family Conflict					.82 (1.37)	.06	.60	[-1.91, 3.56]
	Step 3	.37	5.93^{**}	.00	.39				
	CPI x Family Conflict					-.73 (1.17)	-.07	-.62	[-3.08, 1.62]

Note. N = 68. (Y) = Youth Report; (P) = Parent Report; TR = Treatment Responsibility; CPI = Collaborative Parent Involvement. All regression coefficients are from the final step.

$^{*}p \leq .05$

$^{**}p \leq .01$

Table 5

Hierarchical Linear Regressions Predicting Pediatric Parenting Stress

Model	Predictor	R^2	*F*	ΔR^2	ΔF	*B (SE)*	β	*t*	95% CI
Equal TR (Y) x Family Conflict (Y)	Step 1	.01	.32	.01	.32				
	A1c					4.30 (3.59)	.14	1.20	[-2.87, 11.46]
	Adherence					.47 (.68)	.09	.69	[-.89, 1.82]
	Step 2	.12	2.04	.10	3.74^{*}				
	Equal TR					4.63 (6.29)	.09	.74	[-7.92, 17.18]
	Family Conflict					$18.35\ (6.31)^{**}$	.36	2.91	[5.75, 30.95]
	Step 3	.16	2.51^{*}	.05	4.04^{*}				
	Equal TR x Family Conflict					$-13.23\ (6.59)^{*}$	-.25	-2.01	[-26.38, -.08]
Equal TR (P) x Family Conflict (P)	Step 1	.01	.32	.01	.32				
	A1c					-1.21 (3.10)	-.04	-.39	[-7.40, 4.97]
	Adherence					.38 (.55)	.07	.69	[-.71, 1.47]
	Step 2	.36	9.45^{**}	.35	18.43^{**}				
	Equal TR					-3.18 (5.04)	-.06	-.63	[-13.25, 6.89]
	Family Conflict					$32.69\ (5.13)^{**}$	.64	6.38	[22.46, 42.93]
	Step 3	.39	8.48^{**}	.03	3.29				
	Equal TR x Family Conflict					-7.72 (4.23)	-.18	-1.81	[-16.22, .78]
CPI (Y) x Family Conflict (Y)	Step 1	.01	.32	.01	.32				
	A1c					4.29 (3.61)	.14	1.19	[-2.92, 11.49]
	Adherence					-.25 (.70)	-.05	-.36	[-1.64, 1.14]
	Step 2	.14	2.68^{*}	.13	5.02^{*}				
	CPI					$12.78\ (6.45)^{*}$	-.25	1.98	[-.11, 25.66]
	Family Conflict					$14.94\ (5.91)^{**}$	.29	2.53	[3.13, 26.74]
	Step 3	.14	2.12	.00	.00				
	CPI x Family Conflict					-.28 (6.30)	-.01	-.04	[-12.84, 12.28]
CPI (P) x Family Conflict (P)	Step 1	.01	.32	.01	.32				
	A1c					-1.10 (3.22)	-.04	-.34	[-7.52, 5.33]
	Adherence					.30 (.55)	.06	.53	[-.81, 1.40]
	Step 2	.36	9.55^{**}	.35	18.62^{**}				
	CPI					2.53 (5.17)	.05	.49	[-7.79, 12.85]
	Family Conflict					$30.22\ (5.31)^{**}$	.59	5.69	[19.63, 40.82]
	Step 3	.37	7.75^{**}	.01	.73				
	CPI x Family Conflict					-4.04 (4.75)	-.09	-.85	[-13.53, 5.44]

Note. N = 72. (Y) = Youth Report; (P) = Parent Report; TR = Treatment Responsibility; CPI = Collaborative Parent Involvement. All regression coefficients are from the final step.

*p ≤ .05

**p ≤ .01

Figure 1. Conceptual Model

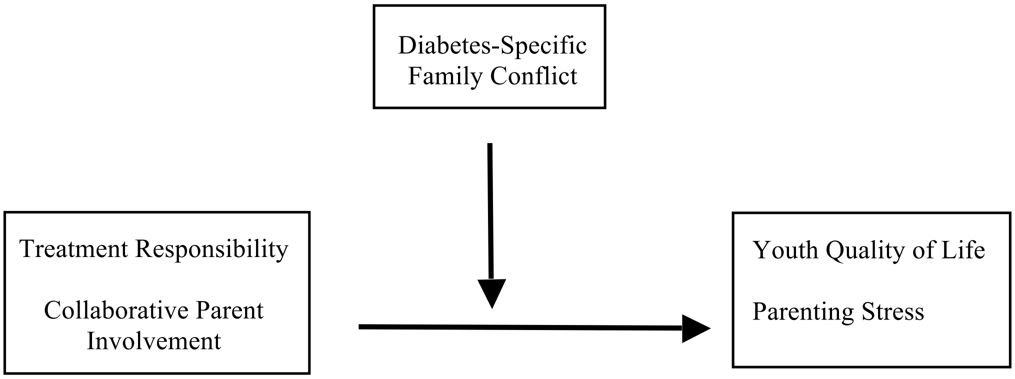

Figure 1. Moderation model tested according to guidelines provided by Aiken & West (1991).

Figure 2. Shared Treatment Responsibility X Family Conflict in Predicting Impact of Diabetes on Youth Quality of Life

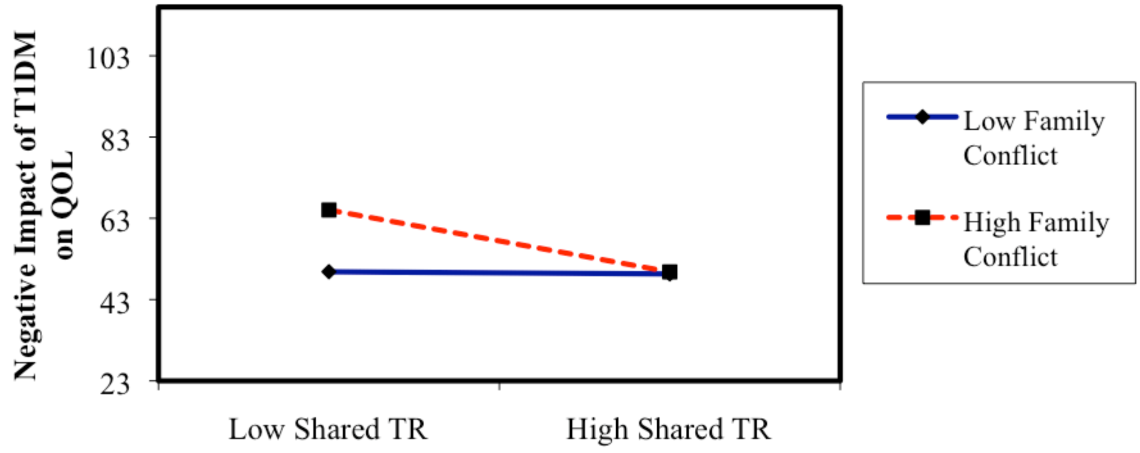

Figure 2. Regression lines for relations between youth reported shared treatment responsibility (TR) and impact of diabetes on youth QOL as moderated by youth report of diabetes-specific family conflict (2-way interaction).

Figure 3. Shared Treatment Responsibility X Family Conflict in Predicting Illness-Specific Parenting Stress

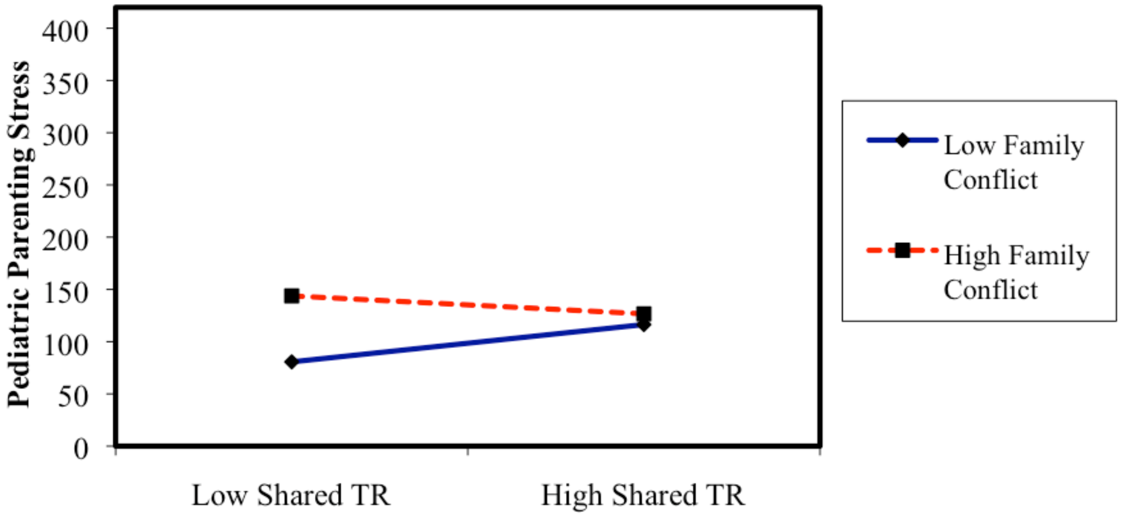

Figure 3. Regression lines for relations between youth reported shared treatment responsibility (TR) and pediatric parenting stress as moderated by youth report of diabetes-specific family conflict (2-way interaction).

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