# THE RELATION BETWEEN FAMILY FUNCTIONING, HEALTH-RELATED QUALITY OF LIFE, AND METABOLIC CONTROL IN CHILDREN AND ADOLESCENTS WITH TYPE 1 DIABETES

A Dissertation

by

KELLY ANN LAWRENCE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2010

Major Subject: School Psychology

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August 2010

Major Subject: School Psychology

# ABSTRACT

The Relation Between Family Functioning, Health-related Quality of Life, and Metabolic Control in Children and Adolescents with Type 1 Diabetes. (August 2010)

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Chair of Advisory Committee: Dr. Cynthia A. Riccio

The purpose of this study was to examine the relationship between family functioning, health-related quality of life, and metabolic control in order to identify areas for intervention that can improve medical and psychosocial outcomes for children and adolescents with type 1 diabetes. Children (N = 45) ages 8-17, both male and female, with type 1 diabetes, along with one caregiver (parent or legal guardian) (N = 45) were asked to complete the Pediatric Quality of Life Inventory (PedsQL) generic and diabetes-specific form to assess health-related quality of life along with the Diabetes Family Behavior Checklist and the Family Relationship Index of the Family Environment Scale to assess family functioning. Recent Hemoglobin A1c (A1c) was obtained from the physician at their visit or by parent report to assess metabolic control.

Results indicated a significant relationship with poorer metabolic control relating to poorer physical health-related quality of life, as reported by children. All reports indicated a significant correlation between metabolic control and both general and diabetes specific health-related quality of life. There was a significant relationship with mother's educational level on the outcome variables; educational level was therefore used as a control variable in all regression analyses. Child-reported general family functioning

accounted for a significant amount of variance in child reported general health-related quality of life. Parent score on the non-supportive scale for diabetes specific family functioning accounted for a significant amount of variance in parent reported general health-related quality of life and diabetes specific health-related quality of life for their child. Results demonstrated the importance of obtaining both child and parent perspectives on issues regarding general family functioning and health-related quality of life and diabetes specific family functioning and health-related quality of life. In addition, they illustrated the importance of assessing health-related quality of life for children with diabetes as opposed to merely looking at the physical effects.

# ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. Riccio, and my committee members, Dr. Ash, Dr. Jensen-Doss, and Dr. Heffer for their guidance and support throughout the course of this research. I also want to extend my gratitude to Dr. Bryant and Dr. Wilson at Scott & White Hospital for connecting me with their diabetes patients and their patients who were willing to participate in the study.

I would also like to thank my friends and colleagues and the department faculty and staff for making my time at Texas A&M University a great experience. Finally, I would like to thank my family for their encouragement and patience throughout this process.

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# CHAPTER I

## INTRODUCTION

Diabetes management is an important component of metabolic control (i.e. blood sugar control), and one that often deteriorates in adolescence. Research has shown the importance of family functioning, including parenting styles, parental support, and marital functioning, and its effect on metabolic control and health-related quality of life. This research identifies the importance of family functioning, but thus far has not clearly shown the effects of family functioning on health-related quality of life and metabolic control, especially during the transition from pre-adolescence to adolescence. Much research has focused only on adolescence; it is important to examine these variables with children as well, as this may be a better point of intervention to help them maintain good metabolic control in adolescence. Many interventions consider working with the family to improve adherence, metabolic control, and psychosocial outcomes. It is important to identify and examine the relationship between family functioning, health-related quality of life, and metabolic control to identify children who may be at risk for poorer control. Assessing these factors can also lead one to identify areas for intervention. There have been many interventions that have shown promising results; identifying family factors and factors related to health-related quality of life is the first step towards intervention.

The relationship between family functioning, health-related quality of life, and metabolic control can assist physicians in providing intervention for the family. A family systems approach is ideal when working with children with diabetes because the

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This dissertation follows the style of *Journal of Pediatric Psychology*.

family is an integral part in helping and supporting them with their diabetes regimen. The measures used to assess family functioning and health-related quality of life may be able to act as screeners for children at risk for worsening control. Identifying those at risk is especially important during pre-adolescence, since metabolic control tends to worsen in adolescence. By identifying children with possible negative family interactions which could affect their metabolic control, physicians and psychologists can intervene early and reduce the chance of worsening control in adolescence. The purpose of this study is to examine the relationship between family functioning, health-related quality of life, and metabolic control in order to identify areas for intervention that can improve medical and psychosocial outcomes for children and adolescents with type 1 diabetes.

# CHAPTER II

## REVIEW OF LITERATURE

Diabetes, in particular type 1 insulin-dependent diabetes, is a disease in which the body's pancreas fails to produce insulin. Type 1 diabetes has also been known as juvenile-onset diabetes and is typically diagnosed in children, adolescents, or young adults. According to the Centers for Disease Control (2005), 5-10% of all cases of diagnosed diabetes are type 1 diabetes; about 1 in every 400 to 600 people under 20 years of age has type 1 diabetes.

Among all types of diabetes (i.e., type 1, type 2, and gestational), type 1 diabetes is the most prevalent type among youth in the United States. A greater proportion of non-Hispanic White youth are diagnosed with diabetes under the age of 10, but these ethnic differences are not as pronounced among ages 10-19. Many of the ethnic differences in this older age group are among youth diagnosed with Type 2 diabetes. Among youth age 0-9 years, there was no gender difference in prevalence of type 1; there was a gender difference among some minority groups (Black and Asian/Pacific Islander) age 10-19 years, with females having higher rates. (SEARCH for Diabetes Youth Study Group, 2006).

Metabolic control (i.e. blood sugar control) is important to physical health; it involves the body producing insulin to be able to regulate blood sugar control. People with type 1 diabetes are no longer able to produce insulin; their body mistakenly attacks insulin-producing cells. In order for people with diabetes to stay alive, they must inject themselves with insulin, either through multiple daily shots, or through an insulin pump,

which gives a constant flow of insulin. To stay healthy, they need to follow a strict daily regimen of testing their blood sugar and giving themselves insulin, while balancing diet and regular exercise. They must problem solve and monitor their food intake and exercise based on their blood sugar level (e.g., not exercising when the blood sugar is low, waiting to eat and giving insulin if the blood sugar is high, giving the correct dosage of insulin given the amount of food). For people who do this successfully, their metabolic control can be similar to a normal healthy person. Those individuals who do not attain and maintain metabolic control are at risk for many serious health problems, such as blindness and kidney failure. The Diabetes Control and Complications Trial is the largest diabetes study conducted to date that explored the effects of intensive treatment on individuals with diabetes over the age of 13 for a span of 10 years (National Diabetes Information Clearinghouse, 1993). They found that lowering blood glucose levels reduced the risk of kidney disease by 50%, eye disease by 76%, and nerve disease by 60%. They also found that better metabolic control slowed the progression of these diseases by at least 50%. This trial showed the importance of maintaining good metabolic control in order to reduce the risks of complications.

Diabetes can also have an impact on one's emotional state. The co-morbidity of diabetes and depression in children and adolescents is a significant problem, with depression affecting children and adolescents with diabetes about two to three times more, respectively, than those without diabetes (Grey, Whittemore, & Tamborlane, 2002). There also seems to be a higher risk of depression in girls with diabetes than boys (Hood et al., 2006; Lawrence et al., 2006). Grey et al. (2002) suggested that poor metabolic control in youth with diabetes and depression may be associated with both

physiological and behavioral factors. They posited that depression may make adherence to the diabetes care regimen more difficult and hypersecretion of cortisol, which is common in depressed individuals, may impair the body's response to insulin. Academic and behavioral problems can also occur in youth with poor metabolic control. McCarthy et al. (2003) found that children with poor control performed significantly worse on reading scores, grade point average, and core total scores (composite of math, reading, and language) than those with good control. Findings also indicated that hospitalizations due to poor control negatively affected academic performance. Many youth with type 1 diabetes reportedly do not have more behavior problems than their healthy counterparts (Leonard et al., 2002; Duke et al., 2008); however, those in poor control may have more behavior problems. For example, Leonard et al. (2002) found that youth in poor control reported more externalizing problems than those in better control. Therefore, it is imperative that children with diabetes have the support that they need to be able to control their disease. Since the onset of type 1 diabetes occurs mainly in childhood and adolescence, parents of these youth play a primary role in managing their children's diabetes treatment regimen.

### *Family Functioning and Diabetes*

One area of support that is vital to diabetes management for children and adolescents is that of the family. Children and adolescents need help from their family, specifically parents, to manage and cope with their diabetes. Younger children especially need assistance from the family, as they are not able to perform as many of the diabetes management tasks. Family relationships and interactions involving diabetes management are especially important during adolescence, when metabolic control tends to worsen.

Metabolic control in adolescence is affected by the reciprocal relationship between the physiological effects of diabetes, the physiological effects of puberty, and developmental and psychosocial variables. Specifically, in adolescence, parents decrease their roles in managing their children's diabetes; they expect their children to be more independent and take more responsibility for their own diabetes management. Not only do adolescents with diabetes have to deal with the normal stressors of this developmental period, but they also experience the stressors of diabetes management. Stress can have a negative effect on metabolic control through biological processes with higher stress linked with poorer control (Hanson, Henggeler, & Burghen, 1987). As a result, diabetes in adolescence can mark a time of decreased metabolic control (Cameron, Young, & Wiebe, 2007; Hesketh, Wake, & Cameron, 2004). Due to these factors, many studies have focused on this developmental period compared to pre-adolescence as a time to examine family functioning and its relation to metabolic control.

One exploratory study done by Nilsson (2001) examined common problems of 18 children with type 1 diabetes who were known as "frequent flyers" because of their frequent admissions to the hospital. These children had four or more unplanned admissions to the hospital over about a three year period. Results indicated that 61.1% of the children had parents with psychological problems, 50% reported parent over-involvement, and 44.4% had a non-traditional family structure and general family stress. While this particular study simply looked at common themes among these children with poorer diabetes control, the reported areas of concern have been studied in depth by others to examine the specific family factors and processes that positively and negatively affect metabolic control. Leonard, Jang, Savik, and Plumbo (2005) investigated specific

aspects of family functioning in relation to metabolic control. They looked at parent and adolescent ratings of family problem solving, communication, roles, affective responsiveness, affective involvement, behavior control, and general functioning. Results indicated that the older the age of the child, the more dysfunctional they saw their families in the areas of affective response and behavior control. In addition, parents of older adolescents reported more dysfunction in areas of problem solving, roles, affective involvement, and general functioning. In their sample, for each year of age, the child was 1.2 times more likely to have decreased metabolic control. These results emphasize the deterioration of metabolic control and difficulty in family relations in adolescence, and highlight the importance of examining family functioning in relation to diabetes management.

It is especially important to examine illness-specific functioning to determine what areas contribute to better metabolic control. Lewin et al. (2006) investigated diabetes-specific family functioning in relation to metabolic control. The specific constructs they explored were parental guidance and control, parental warmth and caring, parental criticism and negativity, and no responsibility for diabetes management. After demographic variables were considered, all four family construct variables accounted for an additional 34% of the variance in metabolic control, indicating that they have a significant impact on the child's diabetes. An age interaction was also found indicating that critical and negative parenting was significantly correlated with poor metabolic control for adolescents age 13 and above, but was not significant for younger children. Adolescents may be more sensitive to critical and negative parenting due to developmental factors, such as trying to increase their independence and take more

control of their diabetes management, which in turn can increase conflict in the family. Thus, adolescents who perceive this type of parenting may be less likely to work with their parent to help with diabetes management tasks and consequently have poorer metabolic control. Results also showed that, while the addition of adherence reduced the effect of family factors, there was still a significant relationship of these factors with metabolic control, indicating that family factors have a direct and indirect relationship on this outcome.

Marteau, Bloch, and Baum (1987) also found a direct and indirect relationship of family factors on metabolic control. Their study assessed family functioning in terms of family cohesion, expressiveness, and conflict. Results indicated that the more cohesion and expressiveness in conjunction with less conflict, the better the metabolic control of the child. Their model showed a direct relationship of family functioning on metabolic control by its impact on the physiological state of the child. There was an indirect relationship through the effect of family functioning on behavioral management, thus having an impact on metabolic control. Another study investigating family functioning in terms of cohesion, expressiveness, and conflict also found that this variable was a significant predictor in diabetes management (Naar-King, Podolski, Ellis, Frey, & Templin, 2006). This study adds to previous literature because the sample was more culturally diverse and many of the participants had low socioeconomic status. This population is often hard to find in the literature on diabetes, and suggests more generalizability of results, as this study's findings are consistent with other research.

*Marital Functioning*

Marteau, Bloch, and Baum's (1987) study investigated another important aspect of family factors- marital functioning. They found that mothers who were more satisfied with their marriage had children who had better metabolic control. Also, when the discrepancy between parent ratings of their marriage was larger, the child had poorer control. These findings indicate that the marital relationship is important in the family functioning with diabetes; marital stress can have negative effects on being able to help manage the disease. Lewandowski and Drotar (2007) investigated the role of spousal support and social support networks on mother-child conflict and adherence. Results showed that spousal support was a stronger predictor than the social support network on levels of mother-child conflict; higher levels of spousal support predicted lower levels of conflict. While not significant, there was a trend that indicated that the level of conflict may impact the positive effect of spousal support; the authors indicate that perhaps a larger sample would show significance for this effect. Thus, marital functioning is an important aspect to consider when working with families coping with diabetes. Spousal support may provide a protective factor for mothers beyond that of their social network. Having the support of another parent in managing the child's diabetes may make it easier to complete management tasks and solve problems when they occur.

*Parental Involvement*

Some studies have examined the relationship between parental involvement and its effects on metabolic control, specifically what type of involvement promotes better control. Wiebe et al. (2005) examined children's appraisals of maternal involvement in coping with diabetes. They studied three types of involvement with diabetes

management: uninvolved (e.g., not assisting in diabetes management), controlling (e.g., overly or intrusively involved), and collaborative (e.g., negotiation and joint decision making). Overall, when children appraise their mothers as being collaborative, they have better control, and there is no negative effect on health-related quality of life. Poorer adherence and poorer health-related quality of life were associated with maternal uninvolvement regardless of age. Maternal control interacted with age; older children showed poorer metabolic control when they appraised their mother as controlling than did younger children. This finding indicates that more control over younger children is acceptable, and may be necessary in some situations, but that a more collaborative relationship needs to be formed as the child gets older.

A subsequent study investigated both children and mother's appraised involvement and its effect on the emotional adjustment for both (Berg et al., 2007). This study looked at four dimensions of involvement: collaborative, supportive, controlling, and uninvolved. An appraised collaborative relationship was associated with better outcomes, as was found in the previous study. Collaboration was associated with fewer depressive symptoms and more positive emotion and was consistent across age. Appraised parental support also had a positive relationship with having less depressive symptoms for children. Both children's and mother's appraised uninvolvement was associated with more depressive symptoms, and for mothers, less positive emotion when they had older children. This age effect could be due to the adolescent becoming more independent with their diabetes management, making the mother feel uninvolved through no choice of her own.

These studies emphasize the importance of a collaborative relationship where diabetes management and problem solving are performed with the child and parent or parents working together. A higher level of collaboration among caregivers and children with diabetes has been shown to have a positive effect on a variety of outcomes, including metabolic control, health-related quality of life, and self-efficacy (Wysocki, et al., 2009). It is also important to note that these studies examined *appraisals* of involvement, rather than a more objective measure of involvement. This is a more practical way to assess the relationship because adolescents and parents can view things differently. A more objective measure may show the mother as having "collaborative" involvement; if the adolescent views it as "controlling", then it will not have the same positive effects. It has also been demonstrated that a shared responsibility of diabetes management is related to better outcomes among adolescents than a primarily parent or child responsibility (Helgeson, Reynolds, Siminerio, Escobar, & Becker, 2008). It is important that the family communicate well so that everyone perceives a more collaborative relationship.

*Maternal Anxiety*

Anxiety in mothers has also been shown to be related to diabetes control. Cameron, Young, and Wiebe (2007) investigated maternal trait anxiety and its effects on children's functioning and diabetes control. The authors noted that maternal anxiety may result in excessive parental monitoring, promotion of sick-role behaviors, and may cause mothers to feel that their children are not as competent in managing their own diabetes. Results showed that mothers with high trait anxiety did indeed rate themselves as being more involved in the diabetes care and their adolescents as having poorer management

skills. From the adolescent reports, mothers with high trait anxiety were seen as having more control and being over-protective. There were also some age differences found among the sample. Younger adolescents whose mothers had high trait anxiety had worse metabolic control and more absences from school. This could be due to the fact that mothers have more control over whether or not their child stays home from school when they are younger. Older adolescents with high anxious mothers also exhibited more motivational and affective disturbances. In addition, in late adolescence, high maternal trait anxiety was associated with low autonomous motivation for the adolescent. This suggests that there is not only a lack of transfer of some diabetes responsibilities, but that the adolescent does not have the desire to take over some of these responsibilities. This is a very important transition during this time period where parenting style, communication, and parental monitoring become key factors in diabetes management. Families in which mothers have high anxiety are at a higher risk for more problems during this period.

*Parenting Style*

A study done on parenting styles and its effect on adherence and control indicated that parental warmth was significantly associated with better control (Davis, et al, 2001). This study investigated parenting styles on preschool and elementary age children, specifically targeting this age group due to the greater dependence on parents for diabetes management. Parental warmth was the only significant predictor, accounting for 27% of the variance in adherence ratings. This signifies the importance of parental support and communication with children, and may be even more important in adolescence. These factors were investigated in a sample of adolescents in a study done by Hanna, Juarez,

Lenss, and Guthrie (2003). Results indicated that less communication agreement was associated with worse metabolic control. In general, adolescents reported that they sought less support than they received, which could cause parent-child conflict due to this struggle for balance. Ellis et al. (2007) asserted that parental monitoring and parental support have different effects on metabolic control. They found that direct monitoring of diabetes care is a stronger predictor of adherence outcomes than parental support for diabetes care. There is a relationship, however, between these two variables; parents who provided more support in the form of praise, reinforcement, and opportunities for good diabetes care, were more likely to closely monitor their child's care. From adolescent reports, the monitoring and support interaction was a significant predictor; the authors posited that this result suggests that adolescents may communicate with their parents more under supportive conditions, thus making it easier for the parent to monitor the care. These results indicate a relationship where support is important, but not sufficient for good control without parental supervision and monitoring of management tasks. This relationship can become especially difficult in adolescence when families need to find the right balance of support and monitoring to help their child become more independent.

Another important factor in the parental supportive relationship is that of the child's perception. It is also possible that adolescents and children may view things differently in terms of what parental supportive behaviors they think are helpful. While parents may feel that they are being very supportive and helpful, their child may feel differently. Lewin et al. (2005) found that child reports of non-supportive parental behavior were more strongly correlated with adherence and metabolic control. This

emphasizes the importance of the child's perception of support and the need for both parent and child reports.

### *Health-related Quality of Life and Diabetes*

Another important area to examine in children with diabetes is that of health-related quality of life. "Quality of life" is a very broad term and can encompass many different things, including happiness and satisfaction with life, and takes on different meanings depending on what aspects are being examined. Due to this ambiguity, the term "health-related quality of life" is generally used when examining factors involving clinical medicine (Fayers & Machin, 2007). For the purposes of this study, health-related quality of life will be used and is defined as "an individual's subjective experience of illness and the impact that illness and its treatment has on the individual's functioning across a variety of domains" (Weissberg-Benchell, et al., 2009, p.977).

As Levi and Drotar (1998) pointed out, assessing health-related quality of life can "improve the clinical decision-making process by increasing understanding of the consequences and experiences associated with different illnesses from childrens' and adolescents' perspectives" (p.5). Since diabetes requires intensive treatment and people must follow a strict regimen, it is important to make sure that a high health-related quality of life is maintained. It is important when looking at health-related quality of life in children with chronic illness that one examines both general health-related quality of life and disease specific health-related quality of life. Some studies find that children with diabetes do not differ from normal children in their general health-related quality of life (Graue et al., 2003; Laffel et al., 2003). It is still important to assess this, however,

because general health measures examine issues that are important to all children, while disease-specific measures may overlook some of these crucial issues.

Hesketh, Wake, and Cameron (2004) examined possible differences in health-related quality of life of children with diabetes over a 2 year period in both parent reports and adolescent reports. Interestingly, there was no significant difference on health-related quality of life according to the parent reports. The adolescent reports, however, showed some significant differences. There were small improvements in reports on bodily pain and general health perceptions; Family Activities scores improved greatly. There was, however, a moderate worsening of scores on behavior scales according to adolescent reports. This study also examined the effects of health-related quality of life on metabolic control. They found, not surprisingly, that control worsened over the 2 year period, as these children got older. Children who had poorer control also had significantly poorer Psychosocial Summary scores, including poorer scores on behavior, mental health, family activities, and family cohesion. Although the results did not demonstrate a predictive relationship between health-related quality of life scores and subsequent metabolic control, there were some significant correlations found. According to reports from their sample, children who report lower scores on health-related quality of life are likely to have and continue to have poorer metabolic control, thus placing them at higher risk for diabetes complications.

Another study found more concordance between parent and adolescent reports of health-related quality of life and psychosocial issues. De Wit et al. (2007) found that there were moderate to high levels of agreement between parents and adolescents. The only scores that differed were those for behavioral problems, which adolescents rated less

than their parents. This difference contributed to a significant difference on the Psychosocial Summary scale. Results indicated that lower scores for psychosocial well-being and higher depression scores were associated with more diabetes-specific family conflicts. Another interesting finding from their study was that overall, a satisfactory general health-related quality of life was reported, even though metabolic control is not optimal for most of the participants. This finding emphasizes the importance of using both general and disease-specific measures when assessing health-related quality of life. A general health-related quality of life measure may not be specific enough to be able to assess the true health-related quality of life of a child living with diabetes.

The relation between health-related quality of life and differences in age or gender has also been an important contribution to this research. A study done by Graue et al. (2003) found that age was a significant factor on diabetes-specific health-related quality of life, with older adolescents reporting lower scores on both general and disease-specific measures. This finding is not surprising given the association with metabolic control and age. It appears that not only does diabetes control get worse with age, but the health-related quality of life of these children also deteriorates, thus showing the importance of screening and intervention for these children. A gender difference was also found with girls reporting lower scores on general measures of mental health, self-esteem, and family cohesion, and diabetes-specific measures of health-related quality of life, worry, and satisfaction. This finding suggests that girls may be at a higher risk of having psychosocial problems, and therefore, may be at a higher risk for poor metabolic control.

The relation between health-related quality of life and metabolic control is varied, with some studies finding no association (Graue, Wentzel-Larsen, Hanestad, & Søvik,

2005; Grey, Davidson, Boland, & Tamborlane, 2001), while others find a link (Hoey et al., 2001; Lewin, et al., 2005). Hoey et al. (2001) found a link between metabolic control and health-related quality of life using a disease-specific measure. Better metabolic control was significantly associated with lower perceived diabetes impact and less worry on adolescent reports. It was also significantly associated with a better health-related quality of life and less perceived burden on health professional and parent reports. Worse metabolic control was significantly associated with less diabetes satisfaction and poorer health perception on adolescent reports. The study also emphasized the decrease in control as children get older and its effect on worry, particularly for girls. These findings further illustrated the difference for girls compared to boys in that girls had significantly more worries, especially after age 12, and had poorer health perceptions.

The relationship between metabolic control and health-related quality of life is complex especially when including family factors, as evidenced by the mixed research findings. A better understanding of this relationship may help refine interventions and better identify children at risk for diabetes complications as a result of poor metabolic control. With the probable decrease in metabolic control in adolescence, it is important to assess both family functioning and health-related quality of life before children reach this developmental period. Assessing these factors will hopefully find children who may be at risk for even poorer control in adolescence. One can then intervene to improve family functioning and health-related quality of life and therefore decrease the risk for diabetes complications.

*Health-related Quality of Life and Family Functioning*

Whittemore, Urban, Tamborlane, and Grey (2003) examined factors that could be associated with health-related quality of life and metabolic control, including child, parent, and family factors. Results showed that, in general, health-related quality of life was reported as good. Children who reported better health-related quality of life reported more warm and caring family behaviors, less depressive symptoms, and found coping with diabetes less upsetting. These children also had parents who reported less depressive symptoms and found diabetes less upsetting. They did not find a significant association with metabolic control except for its association with father's education. When the demographic variables were controlled, family functioning, child adjustment, and parent adjustment were significant predictors of health-related quality of life. These results further emphasize the importance of measuring family factors and health-related quality of life to recognize those at risk for psychological distress or maladjustment and intervene appropriately.

Further examining parental factors, Graue et al. (2005) investigated parental involvement, care, and control and its relation to health-related quality of life. Their study included groups of adolescents with diabetes, physically disabled adolescents, and healthy adolescents. Results indicated that overall, adolescents with diabetes reported more parental involvement and rated their parents as more controlling than the physically disabled and healthy groups. More parental involvement was not negative, however, as it, along with parental care, was positively correlated with health-related quality of life. Parental control, on the other hand, was negatively correlated with health-related quality of life. Those who reported a higher degree of parental control also reported more

diabetes-related worry. These results indicate that high parental involvement and care are supportive and beneficial to the health-related quality of life for adolescents with diabetes. A risk factor for lower health-related quality of life could be parental control and overprotection, and therefore may be a point of intervention for these youths and their families.

Laffel et al. (2003) examined family conflict in relation to health-related quality of life in youth with diabetes. They found that there was a significant relationship between health-related quality of life and diabetes-specific family conflict, both at baseline and one year later. Children with lower overall health-related quality of life reported higher diabetes-specific family conflict, and a similar result was found with the parent reports. This suggests that diabetes-specific family conflict is a good target for intervention to decrease the risk of lower health-related quality of life, and lower psychosocial functioning.

Faulkner and Chang (2007) investigated family behavior surrounding diabetes and its relation to health-related quality of life. Results showed that the only predictor variable for the outcomes of self-care and health-related quality of life was the score on the warmth-caring subscale of the Diabetes Family Behavior Scale (DFBS) (McKelvey et al., 1993). Families with more warm and caring behaviors contributed to more self-care and better health-related quality of life, including less diabetes-related worry, lower disease impact, and higher life satisfaction.

Weissberg-Benchell, et al. (2009) investigated parent-child behaviors, specifically examining diabetes responsibilities and collaborative relationships, and its impact on health-related quality of life. Results from this study indicated that families who

experienced more family conflict surrounding diabetes issues had children with lower health-related quality of life, while families who had more collaborative parent-child relationships with diabetes issues had children with higher health-related quality of life. Results also indicated that children who perceived their parents as being more psychologically controlling also reported lower health-related quality of life, further showing that the type of involvement, rather than amount of involvement, is more crucial to health-related quality of life.

### *Hypothesized Model*

The hypothesized model (Figure 1) investigates family functioning, along with demographic information, and its relationship to health-related quality of life and metabolic control (outcomes) and also the correlation between health-related quality of life and metabolic control. The model is based on family systems theory, which explains the interrelationships among family variables and health outcomes. A similar model was used in a study done by Faulkner and Chang (2007); their model suggested that family and individual factors influenced self-care, which in turn, influenced both health-related quality of life and metabolic control, which were intercorrelated. Another similar model was used by Grey et al. (2001) in which pre-existing characteristics (age, gender, etc.) influenced family support and guidance, which in turn influenced metabolic control and health-related quality of life.

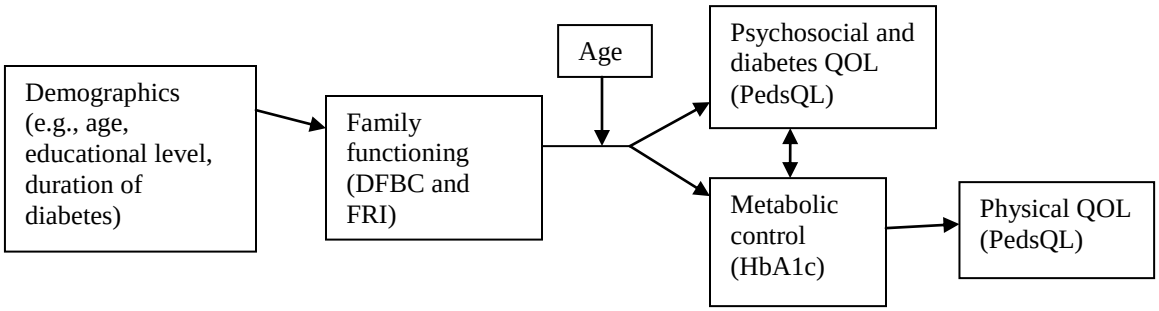


*Figure 1*. Hypothesized model being tested to examine the relationship between age, family functioning, health-related quality of life, and metabolic control.

## *Purpose of Study*

As already stated, diabetes management is an important component of metabolic control, and one that often deteriorates in adolescence. Family functioning is known to be an important factor, but research thus far has not clearly shown the effects of family functioning on health-related quality of life and metabolic control. Much research has also focused only on adolescence; it is important to also examine these variables with children as this may be a better point of intervention to help them maintain good metabolic control in adolescence. Many interventions look at working with the family to improve adherence, metabolic control, and psychosocial outcomes. Most of the successful interventions involve family components; these interventions are perhaps the most promising in working with family functioning to improve diabetes control. It is important to identify and examine the relationship between family functioning, health-related quality of life, and metabolic control in order to identify children who may be at risk for poorer control. Previous research has focused more on adolescence, while this study will put equal focus on children and adolescents in an attempt to identify children at risk before their diabetes control worsens. Assessing these factors can also lead one to identify areas for intervention. There have been many interventions that have shown

promising results; identifying family factors and factors related to health-related quality of life is the first step towards intervention. Thus, the purpose of this study is to examine the relationship between family functioning (Diabetes Family Behavior Checklist and Family Relationship Index), health-related quality of life (PedsQL generic core scales and PedsQL Diabetes module), and metabolic control (HbA1c) in order to identify areas for intervention that can improve medical and psychosocial outcomes for children and adolescents with type 1 diabetes.

*Research Questions*

1. Does metabolic control predict physical health-related quality of life?
    a. Physical health-related quality of life can be affected when metabolic control is worse (higher HbA1c); therefore it is suspected that metabolic control will predict ratings of physical health-related quality of life with poorer control associated with worse ratings of physical health-related quality of life.
2. Does metabolic control correlate with psychosocial health-related quality of life?
    a. It is hypothesized that metabolic control will correlate negatively with health-related quality of life, such that lower A1c level (better metabolic control) will relate to a higher quality of life, given previous research.
3. Does the level of family functioning along with age account for both health-related quality of life and metabolic control?
    a. It is hypothesized that more parental support and better family functioning, both general and diabetes specific, will correlate with higher health-related quality of life and better metabolic control (lower HbA1c)

4. Is age a predictor of metabolic control; does age moderate the relationship between family functioning and metabolic control?
    a. Due to metabolic control tending to worsen in adolescence, it is hypothesized that age will moderate the relationship between family functioning and metabolic control. Family functioning and metabolic control are expected to be more strongly correlated during adolescence than childhood.
5. Is age a predictor of general health-related quality of life and diabetes specific health-related quality of life; does age moderate the relationship between general and diabetes specific health-related quality of life and metabolic control?
    a. Again, due to control tending to worsen in adolescence, it is hypothesized that age will moderate the relationship between family functioning and health-related quality of life. General health-related quality of life, diabetes-specific health-related quality of life, and family functioning are expected to be more strongly correlated during adolescence than childhood.
6. Is there an age difference in scores on the "helpfulness" section on the DFBC?
    a. It is hypothesized that there will be an age difference with adolescents (ages 13-18) finding different diabetes management behaviors performed by parents more or less helpful than pre-adolescents (ages 8-12).

# CHAPTER III

## METHODS

The current study used a cross-sectional design with information from parents, children, and from medical records to address specific research questions. To adequately address the research questions with an appropriate alpha level of .05 and medium effect size of .5 (Coehn's d; Cohen, 1988), power analysis using the G*power 2 program (2008) indicated that 128 participants would be needed. It was not possible to obtain 128 participants; a total of only 45 participants was attained. Due to this smaller number of participants, there is a greater likelihood of making a Type II error, in which the data did not detect significance when there is likely one in the population. Given the smaller sample, the use of a larger alpha could have detected significant results for this data; in addition, a larger effect size would have been needed in order to detect significant results. Alternatively, a Type I error could also have occurred, in which the data detected significance when there is none in the larger population, but that is more common with larger sample sizes and a larger alpha.

### *Participants*

Participants were recruited from the Scott & White diabetes clinic through the endocrinologist working at the clinic (n=36); additional participants were also recruited from local diabetes groups (n=9). Children ages 8-17, both male and female, with type 1 diabetes, along with one caregiver (parent or legal guardian) were included in the study. Children were excluded from the study if they had been diagnosed with another chronic illness, had been diagnosed with diabetes within the past year, or their physician felt they had cognitive difficulties which could affect their ability to be more independent with their diabetes care. The majority of participants with diabetes were white (64.4%) females (66.6%) participating at the physician's office (80%). The average age of children with diabetes was 13.36 (2.22) and the average duration of diabetes was 5.53 years (3.78). More children were using an insulin pump (57.8%) to manage their diabetes. The majority of parent/legal guardians reporting were mothers (86.7%). The study sample's demographic characteristics are presented in Table 1.

Table 1

*Participant demographic characteristics*

| Variable | N | % | M (SD) |
|---|---|---|---|
| Age | 45 | | 13.36 (2.22) |
| Age when diagnosed | 45 | | 7.82 (3.41) |
| Duration of diabetes | 45 | | 5.53 (3.78) |
| Gender | | | |
| Male | 15 | 33.3 | |
| Female | 30 | 66.6 | |
| Race | | | |
| White | 29 | 64.4 | |
| African American | 9 | 20.0 | |
| Hispanic | 5 | 11.1 | |
| Other | 1 | 2.2 | |
| Insulin Pump | | | |
| Yes | 26 | 57.8 | |
| No | 19 | 42.2 | |
| Person Reporting | | | |
| Mother | 39 | 86.7 | |
| Father | 4 | 8.9 | |
| Grandparent | 2 | 4.4 | |
| Mother's educational level | | | |
| $9^{th}$-$12^{th}$ grade or less | 3 | 6.7 | |
| High school graduate | 10 | 22.2 | |
| Some college | 12 | 26.7 | |
| College graduate | 14 | 31.1 | |
| Graduate/Professional degree | 6 | 13.3 | |
| Location | | | |
| Scott & White clinics | 36 | 80.0 | |
| Support groups | 9 | 20.0 | |

### *Procedure*

Institutional Review Board (IRB) approval was obtained both from Scott & White and from Texas A&M University. Written consent was obtained by the parent or legal guardian and written assent was given by the children, as they were all over the age of 7. Children and caregivers were asked to complete the PedsQL generic and diabetes-specific form along with the Diabetes Family Behavior Checklist and the Family Relationship Index of the Family Environment Scale (see Measures, below). Caregivers also filled out the demographic form along with answering whether their child uses an insulin pump or multiple daily shots, and the age of their child at diagnosis. Participants completed the forms after their clinic appointment; it took no longer than 25 minutes for them to complete the forms. Participants also had the option of mailing back the forms. Participants coming from diabetes groups had the option of filling out the forms before or after their group met, or taking them home and mailing them back. The most recent Hemoglobin A1c was retrieved from Scott & White's medical records; for participants obtained through diabetes groups, parent report of the most recent Hemoglobin A1c result was used. The data obtained was coded to ensure confidentiality and results are reported in aggregate form. Scores were obtained for parents and children separately for each family functioning and health-related quality of life measure to use in the analyses. In addition, scores were combined together to obtain a mean score for each family functioning and health-related quality of life measure to acquire a combined parent and child report score to use in the analyses. This was done to determine if significant results can be detected by combining reports instead of analyzing them separately. Three recipients were randomly selected to receive a prize for their participation.

## *Measures*

### *Pediatric Quality of Life Inventory 4.0 Measurement Model (PedsQL™)*

The PedsQL (Varni, 2000) measures health-related quality of life in pediatric populations. Both the Generic core scales and the Type 1 Diabetes module will be used. The PedsQL Generic core scale obtains information about general health-related quality of life and has been shown to adequately distinguish between healthy children and children with chronic health conditions (Varni, Seid, & Rode, 1999).

This measure asks participants to rate on a 5-point Likert-type scale how much of a problem each item has been over the previous month with higher scores indicating better health-related quality of life. The Generic core scale yields scores on physical functioning, emotional functioning, school functioning, and social functioning, and also includes a physical health summary score, and a psychosocial health summary score. Internal consistency ranges from .71 to .88 across scales on the child self-report and from .73 to .89 across all scales on the parent proxy-report (Varni et al., 2003).

The PedsQL Type 1 Diabetes module measures diabetes-specific health-related quality of life and includes scales measuring diabetes symptoms, treatment barriers, treatment adherence, worry, and communication. The scoring is the same as the generic scale, with higher scores indicating better health-related quality of life. Varni et al. (2003) reported that internal consistency ranges from .63 to .81 across all scales for the child self-report and from .68 to .84 for the parent proxy-report. The authors also noted that using both scales gives a comprehensive assessment of the health-related quality of life of children with diabetes and correlations with metabolic control have been found.

Reliability results for this study's sample indicated good reliability for the PedsQL across all scales with alpha levels ranging from .88-.91 for parents and .67-.85 for children.

The PedsQL also includes a Family Information Form which obtains demographic information including the child's race/ethnicity, age, gender, parent's marital status and parent educational level. It also includes questions related to disease impact.

*The Diabetes Family Behavior Checklist (DFBC)*

Family functioning related to diabetes was assessed using the DFBC (Schafer, McCaul, & Glasgow, 1986). The DFBC measures supportive and non-supportive parental behaviors in relation to type 1 diabetes. This 16-item measure includes general items and investigates four components of the diabetes regimen: insulin injections, glucose testing, diet, and exercise. It includes both child and parent forms and participants rate the behavior on a 5-point Likert scale. Non-supportive and supportive scales are calculated by adding frequencies for each item with higher scores indicating greater frequencies of behavior. Factor analyses indicate that the measure's items load on two factors for both child and parent versions: non-supportive behavior and supportive behavior. Internal consistencies for child and parent forms range from .74 to .79 for the non-supportive scale and .71-.74 for the supportive scale. Reliability analyses for this study's sample were good for children on the supportive scale, with an alpha level of .81, but only fair for parents on the supportive scale with an alpha level of .45; reliability was fair with alpha levels of .57 for parents and .54 for children on the non-supportive scale. Strong correlations have been found between scores on the DFBC and scores on the warmth and caring subscale of the Diabetes Family Behavior Scale (McKelvey, et al.,

1993), thus demonstrating convergent validity. Parent-child agreement is strong for the non-supportive scale and moderate for the supportive scale on the DFBC. This measure will assess the child's and parent's view of diabetes support, thus giving a more comprehensive assessment. In addition, a relationship with metabolic control using this measure has been demonstrated (Lewin et al, 2005).

Children and adolescents also filled out the "Helpfulness" scale of the DFBC. This 17-item measure asks the child/adolescent to rate how helpful or unhelpful each of the items on the supportive/unsupportive scales are using a 7-point Likert scale ranging from extremely unhelpful to extremely helpful.

*Family Relationship Index (FRI) of the Family Environment Scale (FES)- Third Edition*

General family functioning was assessed using the third edition of the FES (Moos & Moos, 2002). The FES consists of ten subscales assessing three dimensions: relationships, personal growth, and system maintenance. It also consists of three different forms: Real (measures the current family environment), Ideal (measures preferences about ideal family), and Expectations (measures expectations about family). The form used for this study was the Real form of the three subscales comprising the Family Relationship Index (FRI): Cohesion, Expressiveness, and Conflict. This index consists of 27 True/False items with 9 for each subscale. Participants are asked to read a statement and circle whether it is true for their family or false. The score obtained is the sum of all three subscales with reverse scoring on the Conflict subscale. Moos and Moos (2002) report internal consistencies for the Cohesion subscale at .78, the Expressiveness subscale at .69, and the Conflict subscale at .75. Test-retest reliability was also found to be fairly strong with the Cohesion subscale at .86, the Expressiveness subscale at .73, and

the Conflict subscale at .85. Reliability results for this study's sample indicated good reliability with an alpha level of .66 for parents and an alpha level of .74 for children. Alderfer, et al. (2008) found that the FRI was a "well-established" self-report measure of general family functioning and it has also been used many times in pediatric health settings. It can also be a useful tool for assessment of change after intervention (Heffer, Lane, & Snyder, 2003).

*Hemoglobin A1c*

Metabolic control was measured using the results of the most recent Hemoglobin A1c test. This blood test measures the average blood glucose of the child with diabetes over the previous 3-4 month period, with higher numbers indicating poorer blood sugar control. This was chosen to measure metabolic control because of its extensive use in the literature and is also recommended to be standard care practice by the American Diabetes Association ("Executive summary", 2008).

# CHAPTER IV

# RESULTS

Initial examination of the data was undertaken to examine reliability of measures for the sample, as well as to ensure that assumptions needed for analyses were met. All Variance Inflation Factor (VIF) statistics were less than 10, the average not substantially greater than 1, and all tolerance statistics were above .20 indicating that there was no multicollinearity. Casewise diagnostics indicated that no more than 95% of the cases had standardized residuals less than -2 or greater than 2, demonstrating that there was not an abnormal number of outliers. Durbin-Watson statistics were all between 1 and 3, illustrating that errors in the regression analyses are independent. Finally, scatterplots indicated that there was no heteroscedasticity or non-linearity. Unfortunately, there were confidence intervals for the regression analyses that had negative lower bound numbers and positive upper bound numbers, indicating that the model may not be good; all results with negative to positive confidence intervals should be interpreted with caution. Effect sizes were examined to determine evidence of small, medium, and large effects based on Cohen's conventions (1988); $R^2$ values of .02 to .12 are small effect sizes, $R^2$ values of .13 to .29 are medium, and $R^2$ values of .30 and more are large.

Prior to addressing the research questions, analyses were conducted to determine the effects of demographic differences (e.g., parent educational level, duration of diabetes, pump status) on results, in order to determine which demographic variables to control for in subsequent analyses. There was no significant relationship with duration of diabetes predicting metabolic control (Table 2), general health-related quality of life (Table 3) or diabetes specific health-related quality of life (Table 4). Although some

results were not significant, small effect sizes were detected with child report for both general and diabetes specific health-related quality of life from duration of diabetes (Tables 3 and 4). This suggests that there may be a significant relationship with these variables, but it was unable to be detected given the small sample size. Mothers were the majority of respondents in this study with 39 mothers participating out of the total 45 participants. Mother's educational level was shown to be a significant predictor (Tables 5, 6, 7), with higher educational status generally associated with better outcome variables; as a result, this was used in Block 1 for all regression analyses.

Table 2

*Prediction of metabolic control from duration of diabetes*

| | Recent A1c | |
|---|---|---|
| Variable | *B* | 95% CI |
| Constant | 8.46 | [7.49, 9.43] |
| Duration of diabetes | .04 | [-.10, .19] |
| $R^2$ | .01 | |
| *F* | .35 | |

Table 3

*Prediction of general health-related quality of life from duration of diabetes*

| | Person rating QOL | | | | | |
|---|---|---|---|---|---|---|
| | Parent | | Child | | Combined | |
| Variable | *B* | 95% CI | *B* | 95% CI | *B* | 95% CI |
| Constant | 74.44 | [63.98,84.90] | 75.80 | [69.09,82.51] | 75.12 | [67.91,82.34] |
| Duration of diabetes | -.21 | [-1.78,1.36] | .76 | [-.25,1.76] | .27 | [-.81,1.36] |
| $R^2$ | .00 | | .05 | | .01 | |
| *F* | .07 | | 2.31 | | .26 | |

*Note*. QOL = Health related Quality of Life

Table 4

*Prediction of diabetes specific health-related quality of life from duration of diabetes*

| | Person rating dsQOL | | | | | |
|---|---|---|---|---|---|---|
| | Parent | | Child | | Combined | |
| Variable | *B* | 95% CI | *B* | 95% CI | *B* | 95% CI |
| Constant | 67.60 | [58.50,76.71] | 72.79 | [67.29,78.28] | 70.19 | [64.29,76.10] |
| Duration of diabetes | -.25 | [-1.62,1.11] | .77 | [-.06,1.59] | .26 | [-.63,1.14] |
| $R^2$ | .00 | | .08 | | .01 | |
| *F* | .14 | | 3.53 | | .34 | |

*Note.* dsQOL = Diabetes Specific health-related Quality of Life

Table 5

*Prediction of metabolic control from mother's educational level*

| Variable | Recent A1c | |
|---|---|---|
| | *B* | 95% CI |
| Constant | 7.37 | [5.98, 8.75] |
| 9-12 and less vs grad degree | 2.40* | [.002, 4.80] |
| High school grad vs grad degree | 2.33** | [.58, 4.08] |
| Some college vs grad degree | 1.58 | [-.11, 3.28] |
| College grad vs grad degree | .73 | [-.93, 2.38] |
| $R^2$ | .21 | |
| *F* | 2.66* | |

( * p < .05, ** p < .01)

Table 6

*Prediction of general health-related quality of life from mother's educational level*

| | Person rating QOL | | | | | |
|---|---|---|---|---|---|---|
| | Parent | | Child | | Combined | |
| Variable | *B* | 95% CI | *B* | 95% CI | *B* | 95% CI |
| Constant | 90.28 | [75.66,104.90] | 83.33 | [73.29,93.38] | 86.81 | [76.86,96.75] |
| 9-12 and less vs grad degree | -17.18 | [-42.50,8.14] | -3.33 | [-20.73,14.07] | -10.26 | [-27.49,6.97] |
| Some college vs grad degree | -26.66** | [-44.56,-8.75] | -5.14 | [-17.45,7.17] | -15.90* | [-28.08,-3.72] |
| College grad vs grad degree | -11.11 | [-28.58,6.36] | 2.26 | [-9.75,14.27] | -4.43 | [-16.31,7.46] |
| $R^2$ | .232 | | .161 | | .256 | |
| *F* | 3.03* | | 1.92 | | 3.44* | |

( * p < .05, ** p < .01)
*Note*. QOL= Health Related Quality of Life

Table 7

*Prediction of diabetes specific health-related quality of life from mother's educational level*

| | Person rating dsQOL | | | | | |
|---|---|---|---|---|---|---|
| | Parent | | Child | | Combined | |
| Variable | *B* | 95% CI | *B* | 95% CI | *B* | 95% CI |
| Constant | 80.95 | [68.18,93.73] | 74.11 | [65.36,82.85] | 77.53 | [68.86,86.20] |
| 9-12 and less vs grad degree | 12.20 | [-34.33,9.93] | 3.27 | [-11.87,18.42] | -4.46 | [-19.48,10.55] |
| High school grad vs grad degree | -15.69 | [-31.85,.48] | -.06 | [-11.12,11.00] | -7.87 | [-18.84,3.09] |
| Some college vs grad degree | -25.40** | [-41.04,-9.75] | 1.99 | [-8.72,12.70] | -11.70* | [-22.32,-1.09] |
| College grad vs grad degree | -11.82 | [-27.09,3.45] | 7.02 | [-3.43,17.47] | -2.4 | [-12.76,7.96] |
| $R^2$ | .227 | | .079 | | .158 | |
| *F* | 2.93* | | .859 | | 1.88 | |

( * p < .05, ** p < .01)
*Note*. dsQOL = Diabetes Specific health-related

There was a significant relationship with pump status and the outcomes; however, the physician stated that patients who have better blood sugar control are put on insulin pumps, while those who struggle with blood sugar control are not. Therefore, pump status was excluded from the analyses. Additional specific analyses conducted are discussed by research question.

*Research Question 1*

Does metabolic control predict physical health-related quality of life? It was hypothesized that metabolic control would predict ratings of physical health-related quality of life with poorer control associated with worse ratings of physical health-related quality of life. Regression analyses were conducted using metabolic control as the independent variable and the score on the Physical Quality of Life subscale of the PedsQL as the dependent variable. Three separate regression analyses were done for each research question to include parent report, child report, and combined parent and child report (Table 8).

Results indicated a significant relationship for children ($p < .05$) showing that their A1C accounted for 14% of the variance on their physical quality of life score. Children whose blood sugar control was worse had poorer reports on their physical health-related quality of life (e.g., walking, running, energy level). Results were not significant for parent or combined parent and child report indicating that parents did not rate their children as having poorer physical health-related quality of life in comparison to their blood sugar levels. A small effect size was detected for the combined report, most likely due to the significance of the child report; it is possible that with a larger sample, the combined report would have been significant.

Table 8

*Prediction of physical health-related quality of life from metabolic control (N=45)*

| | Person rating for physical health-related quality of life | | | | | |
|---|---|---|---|---|---|---|
| | Child | | Parent | | Combined | |
| Variable | *B* | 95% CI | *B* | 95% CI | *B* | 95% CI |
| Constant | 106.03 | [91.94, 120.12] | 91.45 | [55.11, 127.80] | 98.25 | [78.52, 117.98] |
| Recent A1c | -2.04* | [-3.63, -.455] | -1.16 | [-5.27, 2.95] | -.153 | [-3.75, .70] |
| $R^2$ | .14 | | .01 | | .04 | |
| *F* | 6.73* | | .33 | | 1.92 | |

( * p < .05, ** p < .01)

*Research Question 2*

Does metabolic control correlate with psychosocial health-related quality of life? It was hypothesized that there would be a significant negative correlation given previous research, such that lower A1c level (better metabolic control) will relate to a higher quality of life. Correlation analyses were conducted to determine if metabolic control (HbA1c) correlates with psychosocial health-related quality of life from the PedsQL general health-related quality of life measure and diabetes specific health-related quality of life. Results indicated significant correlations for all reports (see Table 9), suggesting that children's psychological health-related quality of life, including their feelings, relationships, and school performance, and diabetes specific health-related quality of life, including their treatment and worry about diabetes, has an impact on their blood sugar control and vice versa.

Table 9

*Correlation between metabolic control and health-related Quality of Life (QOL) measures (N=45)*

| | Recent A1c |
|---|---|
| Parent reported psychosocial QOL | -.31* |
| Child reported psychosocial QOL | -.42** |
| Combined report psychosocial QOL | -.43** |
| Parent reported diabetes specific QOL | -.32* |
| Child reported diabetes specific QOL | -.38** |
| Combined report diabetes specific QOL | -.43** |

( * $p < .05$, ** $p < .01$)

*Research Question 3*

Does the level of family functioning and age account for both health-related quality of life and metabolic control? It was hypothesized that more parental support and better family functioning, both general (as measured by the FRI) and diabetes specific (as measured by the DFBC) would be significant predictors of general health-related quality of life, diabetes specific health-related quality of life, and metabolic control.

Since age was not found to be a significant predictor, age was not included in the analyses. Separate regression analyses were therefore conducted using metabolic control, general health-related quality of life, and diabetes specific health-related quality of life as the dependent variables and family functioning (general and diabetes specific as separate analyses) as the independent variable in Block 2.

*General Health-related Quality of Life*

Looking first at general family functioning and general health-related quality of life (see Tables 10, 11, 12), results indicated significance for child report of general family functioning on general health-related quality of life, with a significant change in $R^2$. Child FRI accounted for an additional 11% variance in general health-related quality of life after mother's educational level, indicating that child perceptions, but not parent perceptions, on their general family functioning impacts their general health-related quality of life. While the combined report did not have significant results, a small effect size was detected; this is most likely due to the significance of the child report.

Table 10

*Prediction of child reported general health-related quality of life from child report of general family functioning (N=45)*

| | Child rating of general health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 83.33 | 62.01 | [43.78,82.24] |
| 9-12 and less vs grad degree | -3.33 | -2.43 | [-18.87,14.00] |
| High school grad vs grad degree | -11.04 | -10.46 | [-22.46,1.54] |
| Some college vs grad degree | -5.14 | -2.62 | [-14.41,9.17] |
| College grad vs grad degree | 2.26 | 1.31 | [-10.04,12.67] |
| Child FRI score | | 1.08* | [.19,1.97] |
| $R^2$ | .16 | .27 | |
| *F* | 1.92 | 2.94* | |
| $\Delta R^2$ | | .11 | |
| $\Delta F$ | | 6.04* | |

( * p < .05, ** p < .01)

Table 11

*Prediction of parent reported general health-related quality of life from parent report of general family functioning (N=45)*

| | Parent rating of health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 90.28 | 81.34 | [47.99,114.69] |
| 9-12 and less vs grad degree | -17.18 | -17.68 | [-43.28,7.92] |
| High school grad vs grad degree | -23.78* | -23.38* | [-42.08,-4.68] |
| Some college vs grad degree | -26.66** | -25.76** | [-44.07,-7.45] |
| College grad vs grad degree | -11.11 | -10.72 | [-28.40,6.95] |
| Parent FRI score | | .43 | [-1.01,1.87] |
| $R^2$ | .23 | .24 | |
| *F* | 3.03* | 2.45* | |
| $\Delta R^2$ | | .01 | |
| $\Delta F$ | | .365 | |

( * p < .05, ** p < .01)

Table 12

*Prediction of combined report of general health-related quality of life from combined report of general family functioning (N=45)*

| | Combined rating of general health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 86.81 | 69.98 | [47.38,92.59] |
| 9-12 and less vs grad degree | -10.26 | -10.40 | [-27.27,6.47] |
| High school grad vs grad degree | -17.41** | -16.79** | [-29.13,-4.44] |
| Some college vs grad degree | -15.90* | -14.02* | [-26.17,-1.88] |
| College grad vs grad degree | -4.43 | -4.42 | [-16.06,7.23] |
| Combined FRI score | | .85 | [-.18,1.88] |
| $R^2$ | .26 | .31 | |
| *F* | 3.44* | 3.43* | |
| $\Delta R^2$ | | .05 | |
| $\Delta F$ | | 2.78 | |

( * p < .05, ** p < .01)

Looking at general family functioning and diabetes specific health-related quality of life (Tables 13, 14, 15), results indicated that no reports of general family functioning accounted for a significant amount of variance beyond mother's educational level for diabetes specific health-related quality of life. This suggests that children and parent perceptions on general family functioning do not have a significant impact on diabetes specific health-related quality of life. Looking at metabolic control, as measured by recent A1c levels, results indicate that there were no significant effects for reports of general family functioning and recent A1C (Tables 16, 17, 18); parent and child perceptions of general family functioning did not have a significant impact of the child's metabolic control in this sample.

Although all results were not significant, small effect sizes were detected with child report for prediction of diabetes specific health-related quality of life from general family functioning (Table 14) and with parent report for prediction of metabolic control from general family functioning (Table 16). This suggests that there may be a significant relationship with these variables, but it was unable to be detected given the small sample size.

Table 13

*Prediction of parent reported diabetes specific health-related quality of life from parent report of general family functioning (N=45)*

| | Parent rating of diabetes specific health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 80.952 | 73.38 | [68.18,93.73] |
| 9-12 and less vs grad degree | -12.20 | -12.63 | [-35.01,9.75] |
| High school grad vs grad degree | -15.69 | -15.35 | [-31.70,1.01] |
| Some college vs grad degree | -25.40** | -24.64** | [-40.65,-8.63] |
| College grad vs grad degree | -11.82 | -11.49 | [-26.94,3.96] |
| Parent FRI score | | .36 | [-.89,1.62] |
| $R^2$ | .23 | | .23 |
| *F* | 2.93* | | 2.38 |
| $\Delta R^2$ | | | .01 |
| $\Delta F$ | | | .34 |

( * p < .05, ** p < .01)

Table 14

*Prediction of child reported diabetes specific health-related quality of life from child report of general family functioning (N=45)*

| | Child rating of diabetes specific health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 74.11 | 62.73 | [45.25,80.21] |
| 9-12 and less vs grad degree | 3.27 | 3.78 | [-11.16,18.71] |
| High school grad vs grad degree | -.06 | .26 | [-10.64,11.17] |
| Some college vs grad degree | 1.99 | 3.40 | [-7.32,14.12] |
| College grad vs grad degree | 7.02 | 6.49 | [-3.83,16.81] |
| Child FRI score | | .60 | [-.20,1.41] |
| $R^2$ | .08 | | .13 |
| *F* | .86 | | 1.17 |
| $\Delta R^2$ | | | .05 |
| $\Delta F$ | | | 2.29 |

( * p < .05, ** p < .01)

Table 15

*Prediction of combined reported diabetes specific health-related quality of life from combined report of general family functioning (N=45)*

| | Combined rating of diabetes specific health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 77.53 | 73.93 | [53.58,94.28] |
| 9-12 and less vs grad degree | -4.64 | -4.50 | [-19.68,10.69] |
| High school grad vs grad degree | -7.87 | -7.74 | [-18.85,3.37] |
| Some college vs grad degree | -11.70* | -11.30* | [-22.23,-.37] |
| College grad vs grad degree | -2.40 | -2.40 | [-12.88,8.08] |
| Combined FRI score | | .18 | [-.74,1.11] |
| $R^2$ | .16 | | .16 |
| *F* | 1.88 | | 1.50 |
| $\Delta R^2$ | | | .00 |
| $\Delta F$ | | | .16 |

( * p < .05, ** p < .01)

Table 16

*Prediction of metabolic control from parent report of general family functioning (N=45)*

| | Recent A1c | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 7.37 | 5.91 | [2.78,9.04] |
| 9-12 and less vs grad degree | 2.40* | 2.32 | [-.08,4.72] |
| High school grad vs grad degree | 2.33** | 2.40** | [.64,4.15] |
| Some college vs grad degree | 1.58 | 1.73* | [.01,3.45] |
| College grad vs grad degree | .73 | .79 | [-.87,2.45] |
| Parent FRI score | | .07 | [-.07,.21] |
| $R^2$ | .21 | | .23 |
| *F* | 2.67* | | 2.36 |
| $\Delta R^2$ | | | .02 |
| $\Delta F$ | | | 1.11 |

( * p < .05, ** p < .01)

Table 17

*Prediction of metabolic control from child report of general family functioning (N=45)*

| | Recent A1c | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 7.34 | 7.02 | [4.12,9.87] |
| 9-12 and less vs grad degree | 2.40* | 2.42 | [-.02,4.85] |
| High school grad vs grad degree | 2.33** | 2.34* | [.57,4.12] |
| Some college vs grad degree | 1.58 | 1.63 | [-.12,3.37] |
| College grad vs grad degree | .73 | .71 | [-.97,2.39] |
| Child FRI score | | .02 | [-.11,.15] |
| $R^2$ | .21 | | .21 |
| *F* | 2.66* | | 2.10 |
| $\Delta R^2$ | | | .00 |
| $\Delta F$ | | | .78 |

( * p < .05, ** p < .01)

Table 18

*Prediction of metabolic control from combined report of general family functioning (N=45)*

| | Recent A1c | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 7.34 | 6.32 | [3.09,9.55] |
| 9-12 and less vs grad degree | 2.40* | 2.39 | [-.02,4.81] |
| High school grad vs grad degree | 2.33** | 2.37** | [.61,4.14] |
| Some college vs grad degree | 1.58 | 1.7 | [-.04,3.44] |
| College grad vs grad degree | .73 | .73 | [-.94,2.39] |
| Combined FRI score | | .05 | [-.09,.20] |
| $R^2$ | .21 | | .22 |
| *F* | 2.66* | | 2.21 |
| $\Delta R^2$ | | | .01 |
| $\Delta F$ | | | .53 |

( * p < .05, ** p < .01)

*Diabetes-specific Family Functioning*

Regression analyses were done using the supportive and non-supportive scales of the Diabetes Family Behavior Checklist (DFBC), measuring diabetes specific family functioning, with the outcome variables of general health-related quality of life, diabetes specific health-related quality of life, and metabolic control.

Looking at diabetes specific family functioning in relation to general health-related quality of life (Tables 19, 20, 21), results indicated that some significance was found with scores on the DFBC, especially on the non-supportive scale. Interestingly, the supportive scale was negatively correlated with general health-related quality of life which is the opposite of what was hypothesized. Parent score on the non-supportive scale accounted for an additional 29% of the variance in general health-related quality of life after mother's educational level, while children's report accounted for an additional 11% of the variance. In a separate analysis, combined child and parent report accounted for an additional 15% of the variance. These results indicate that parents who view themselves as non-supportive have a negative impact on the child's general health-related quality of life as rated by parents, and children who view their parents as non-supportive rate themselves as having a lower general health-related quality of life. In addition, when child and parent reports are combined, non-supportive behaviors have a negative impact on combined parent and child reported general health-related quality of life.

Table 19

*Prediction of parent reported general health-related quality of life from parent report of diabetes specific family functioning (N=45)*

| | Parent rating of general health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 90.28 | 157.48 | [122.55,192.41] |
| 9-12 and less vs grad degree | -17.18 | -24.24* | [-45.28,-3.20] |
| High school grad vs grad degree | -23.78* | -26.14** | [-41.20,-11.07] |
| Some college vs grad degree | -26.66** | -24.97** | [-39.56,-10.38] |
| College grad vs grad degree | -11.11 | -13.52 | [-27.87,.83] |
| Parent non-supportive | | -16.70** | [-24.61,-8.79] |
| Parent supportive | | -7.83 | [-16.01,.36] |
| $R^2$ | .23 | | .52 |
| *F* | 3.03* | | 6.85** |
| $\Delta R^2$ | | | .29 |
| $\Delta F$ | | | 11.37 |

( * p < .05, ** p < .01)

Table 20

*Prediction of child reported general health-related quality of life from child report of diabetes specific family functioning (N=45)*

| | Child rating of general health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 83.33 | 106.16 | [83.99,128.34] |
| 9-12 and less vs grad degree | -3.33 | -5.22 | [-21.97,11.52] |
| High school grad vs grad degree | -11.04 | -15.43* | [-28.14,-2.73] |
| Some college vs grad degree | -5.14 | -7.52 | [-19.56,4.52] |
| College grad vs grad degree | 2.26 | -2.91 | [-15.20,9.38] |
| Child non-supportive | | -5.70 | [-11.66,.27] |
| Child supportive | | -2.21 | [-7.21,2.80] |
| $R^2$ | .16 | .27 | |
| *F* | 1.92 | 2.37* | |
| $\Delta R^2$ | | .11 | |
| $\Delta F$ | | 2.91 | |

( * p < .05, ** p < .01)

Table 21

*Prediction of combined reported general health-related quality of life from combined report of diabetes specific family functioning (N=45)*

| | Combined rating of general health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 86.81 | 110.91 | [88.71,133.12] |
| 9-12 and less vs grad degree | -10.26 | -10.56 | [-26.40,5.29] |
| High school grad vs grad degree | -17.41** | -18.62** | [-30.22,-7.02] |
| Some college vs grad degree | -15.90* | -13.77* | [-25.31,-2.22] |
| College grad vs grad degree | -4.43 | -6.8 | [-17.87,4.26] |
| Combined non-supportive | | -1.26* | [-2.22,-.31] |
| Combined supportive | | -.16 | [-.89,.57] |
| $R^2$ | .26 | .41 | |
| *F* | 3.44* | 4.31** | |
| $\Delta R^2$ | | .15 | |
| $\Delta F$ | | 4.76* | |

( * p < .05, ** p < .01)

Looking at diabetes specific family functioning and diabetes specific health-related quality of life, significance was found for parent reports with scores on the non-supportive scale of the DFBC (Table 22). Parent report on the non-supportive scale accounted for an additional 13% of the variance in diabetes specific health-related quality of life after mother's educational level. This suggests that parents who view themselves as non-supportive with their child's diabetes care rate their child's diabetes specific health-related quality of life as being lower. There was no significant amount of variance accounted for beyond mother's educational level with the child or combined report (Tables 23, 24). There was, however, a significant change in the F-ratio for child report, indicating that the addition of the supportive and non-supportive scales does have an impact on child reported diabetes specific health-related quality of life. The non-supportive scale approached significance for this regression, and it is possible that with a larger sample size, significance would have been shown. In addition, a small effect size was detected for the combined report, suggesting that significance may have been found given a larger sample size. Looking at diabetes specific family functioning and metabolic control (Tables 25, 26, 27), results indicated that an additional 9% of variance for parent report and 8% of variance for the combined report was accounted for, after mother's educational level, of diabetes specific family functioning with recent A1c. A small effect size was detected with child report for prediction of metabolic control from diabetes specific family functioning, indicating again that significance may have been found given a larger sample size.

Table 22

*Prediction of parent reported diabetes specific health-related quality of life from parent reported diabetes specific family functioning (N=45)*

| | Parent rating of diabetes specific health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 80.952 | 114.59 | [79.24,149.94] |
| 9-12 and less vs grad degree | -12.20 | -17.00 | [-38.29,4.30] |
| High school grad vs grad degree | -15.69 | -17.02* | [-32.26,-1.77] |
| Some college vs grad degree | -25.40** | -24.25** | [-39.01,-9.48] |
| College grad vs grad degree | -11.82 | -12.72 | [-27.24,1.81] |
| Parent supportive scale | | -2.48 | [-10.76,5.81] |
| Parent non-supportive scale | | -10.31* | [-18.31,-2.30] |
| $R^2$ | .23 | | .35 |
| *F* | 2.93* | | 3.43** |
| $\Delta R^2$ | | | .13 |
| $\Delta F$ | | | 3.65 |

( * p < .05, ** p < .01)

Table 23

*Prediction of child reported diabetes specific health-related quality of life from child reported diabetes specific family functioning (N=45)*

| | Child rating of diabetes specific health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 74.11 | 96.43 | [77.44,115.43] |
| 9-12 and less vs grad degree | 3.27 | 1.41 | [-12.94,15.75] |
| High school grad vs grad degree | -.06 | -4.24 | [-15.13,6.65] |
| Some college vs grad degree | 1.99 | -.44 | [-10.76,9.87] |
| College grad vs grad degree | 7.02 | 2.14 | [-8.38,12.67] |
| Child non-supportive | | -5.01 | [-10.12,.10] |
| Child supportive | | -2.62 | [-6.90,1.68] |
| $R^2$ | .08 | | .23 |
| *F* | .86 | | 1.85 |
| $\Delta R^2$ | | | .15 |
| $\Delta F$ | | | 3.62* |

( * p < .05, ** p < .01)

Table 24

*Prediction of combined report diabetes specific health-related quality of life from combined report diabetes specific family functioning (N=45)*

| | Combined rating of diabetes specific health-related quality of life | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 77.53 | 95.82 | [75.66,115.98] |
| 9-12 and less vs grad degree | -4.64 | -4.60 | [-18.99,9.78] |
| High school grad vs grad degree | -7.87 | -8.78 | [-19.31,1.75] |
| Some college vs grad degree | -11.70* | -10.45 | [-20.93,.03] |
| College grad vs grad degree | -2.40 | -4.16 | [-14.20,5.89] |
| Combined non-supportive | | -.84 | [-1.71,.03] |
| Combined supportive | | -.19 | [-.85,.47] |
| $R^2$ | .16 | | .27 |
| *F* | 1.88 | | 2.34 |
| $\Delta R^2$ | | | .11 |
| $\Delta F$ | | | 2.90 |

( * p < .05, ** p < .01)

Table 25

*Prediction of metabolic control from parent reported diabetes specific family functioning (N=45)*

| | Recent A1c | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 7.37 | 3.46 | [-.48,7.40] |
| 9-12 and less vs grad degree | 2.40* | 2.65* | [.28,5.02] |
| High school grad vs grad degree | 2.33** | 2.45** | [.75,4.15] |
| Some college vs grad degree | 1.58 | 1.52 | [-.12,3.17] |
| College grad vs grad degree | .73 | .91 | [-.71,2.52] |
| Parent non-supportive | | .72 | [-.17,1.61] |
| Parent supportive | | .64 | [-.28,1.56] |
| $R^2$ | .21 | | .30 |
| *F* | 2.66 | | 2.71* |
| $\Delta R^2$ | | | .09 |
| $\Delta F$ | | | 2.43 |

( * p < .05, ** p < .01)

Table 26

*Prediction of metabolic control from combined reported diabetes specific family functioning (N=45)*

| | Recent A1c | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 7.34 | 4.70 | [1.42,7.99] |
| 9-12 and less vs grad degree | 2.40* | 2.41* | [.07,4.75] |
| High school grad vs grad degree | 2.33** | 2.46** | [.75,4.18] |
| Some college vs grad degree | 1.58 | 1.45 | [-.26,3.15] |
| College grad vs grad degree | .73 | .98 | [-.66,2.61] |
| Combined non-supportive | | .11 | [-.03,.25] |
| Combined supportive | | .04 | [-.07,.14] |
| $R^2$ | .21 | | .29 |
| *F* | 2.66* | | 2.56* |
| $\Delta R^2$ | | | .08 |
| $\Delta F$ | | | 2.07 |

( * p < .05, ** p < .01)

Table 27

*Prediction of metabolic control from child reported diabetes specific family functioning (N=45)*

| | Recent A1c | | |
|---|---|---|---|
| | Model 1 | Model 2 | |
| Variable | *B* | *B* | 95% CI |
| Constant | 7.34 | 5.97 | [2.73,9.21] |
| 9-12 and less vs grad degree | 2.40* | 2.52* | [.07,4.97] |
| High school grad vs grad degree | 2.33** | 2.58** | [.72,4.44] |
| Some college vs grad degree | 1.58 | 1.75 | [-.01,3.51] |
| College grad vs grad degree | .73 | 1.01 | [-.79,2.81] |
| Child non-supportive | | .25 | [-.63,1.12] |
| Child supportive | | .22 | [-.51,.95] |
| $R^2$ | .21 | | .23 |
| *F* | 2.66* | | 1.89 |
| $\Delta R^2$ | | | .02 |
| $\Delta F$ | | | .47 |

( * p < .05, ** p < .01)

*Research Question 4*

Is age a predictor of metabolic control; does age moderate the relationship between family functioning and metabolic control? It was hypothesized that due to metabolic control tending to worsen in adolescence, age would moderate the relationship between family functioning and metabolic control. Family functioning and metabolic control were expected to be more strongly correlated during adolescence than childhood. Regression analyses were performed to find the main effect of age on metabolic control (see Table 28). Contrary to the hypothesis, age was not found to be a significant predictor for these outcomes and was therefore not used in the subsequent regression analyses. Due to the small sample size and insufficient power to detect significance, this question was not addressed further.

Table 28

*Prediction of metabolic control from age*

| | Recent A1c | |
|---|---|---|
| Variable | *B* | 95% CI |
| Constant | 9.46 | [6.08, 12.83] |
| Age | -.06 | [-.31, .19] |
| $R^2$ | .01 | |
| *F* | .22 | |

*Research Question 5*

Is age a predictor of general health-related quality of life and diabetes specific health-related quality of life; does age moderate the relationship between general and diabetes specific health-related quality of life and metabolic control? It was hypothesized that due to control tending to worsen in adolescence, age would moderate the relationship between family functioning and health-related quality of life. General health-related quality of life, diabetes-specific health-related quality of life, and family functioning were expected to be more strongly correlated during adolescence than childhood. Regression analyses were performed to find the main effect of age on both general health-related quality of life and diabetes-specific health-related quality of life for parent, child, and combined reports (see Tables 29 and 30). Although some results were not significant, small effect sizes were detected with both child and combined report for prediction of general health-related quality of life from age (Table 29) and with child report for prediction of diabetes specific health-related quality of life from age (Table 30). This suggests that there may be a significant relationship with these variables, but it was unable to be detected given the small sample size. Due to the small sample size and insufficient power to detect significance, this question was not addressed further.

Table 29

*Prediction of general health-related quality of life from age*

| | Person rating QOL | | | | | |
|---|---|---|---|---|---|---|
| | Parent | | Child | | Combined | |
| Variable | *B* | 95% CI | *B* | 95% CI | *B* | 95% CI |
| Constant | 70.88 | [34.69,107.06] | 57.90 | [35.12,80.67] | 64.34 | [39.66,89.12] |
| Age | .18 | [-2.49,2.85] | 1.65 | [-.03,3.34] | .92 | [-.91,2.74] |
| $R^2$ | .00 | | .08 | | .02 | |
| *F* | .02 | | 3.93 | | 1.03 | |

*Note*. QOL = Health Related Quality of Life

Table 30

*Prediction of diabetes-specific health-related quality of life from age*

| | Person rating dsQOL | | | | | |
|---|---|---|---|---|---|---|
| | Parent | | Child | | Combined | |
| Variable | *B* | 95% CI | *B* | 95% CI | *B* | 95% CI |
| Constant | 64.07 | [32.55,95.58] | 65.07 | [45.66,84.49] | 64.57 | [44.19,84.95] |
| Age | .16 | [-2.17,2.49] | .90 | [-.54,2.33] | .53 | [-.98,2.03] |
| $R^2$ | .00 | | .04 | | .01 | |
| *F* | .02 | | 1.58 | | .50 | |

*Note.* dsQOL = Diabetes Specific health-related Quality of Life

*Research Question 6*

Is there an age difference in scores on the "helpfulness" section on the DFBC? It was hypothesized that adolescents (ages 13-17) may find different diabetes management behaviors performed by parents more or less helpful than children (ages 8-12). A *t*-test was performed (Table 31) to determine if there was a significant difference on the helpfulness scores among two age groups: pre-adolescent (ages 8-12) and adolescent (ages 13-18). There was no significant difference in the means for any of the items, indicating that children and adolescents had similar views on what they found helpful or not helpful in relation to their diabetes care.

Table 31

*t-test for item differences on the Diabetes Family Behavior Checklist among children (ages 8-12) and adolescents (ages 13-17)*

| Items children rated for how helpful it is when their parent: | Age group | | *t* | *df* |
|---|---|---|---|---|
| | 8-12 | 13-17 | | |
| Praise you for following your diet | 5.93 (1.10) | 5.40 (1.16) | 1.44 | 38 |
| Nag you about testing your glucose level | 4.75 (1.53) | 4.64 (1.79) | .20 | 42 |
| Suggest things that might help you take your diabetes medications on time | 5.94 (1.12) | 5.68 (1.28) | .66 | 39 |
| Criticize you for not exercising regularly | 3.14 (1.92) | 3.38 (1.64) | -.40 | 36 |
| Help you decide if changes should be made based on glucose testing results | 4.87 (1.85) | 5.89 (1.13) | -1.96 | 19.8 |

Table 31 continued

| Items children rated for how helpful it is when their parent: | Age group | | *t* | *df* |
|---|---|---|---|---|
| | 8-12 | 13-17 | | |
| Nag you about not following your diet | 4.00 (2.25) | 4.08 (1.78) | -.12 | 37 |
| Argue with you about your diabetes self- care activities | 3.27 (1.91) | 3.89 (1.69) | -1.11 | 41 |
| Encourage you to participate in sports activities | 5.31 (2.15) | 4.93 (1.33) | .65 | 21.9 |
| Plan family activities so that they will fit in with your diabetes self-care schedule | 5.79 (1.81) | 5.14 (1.18) | 1.39 | 40 |
| Congratulate you for sticking to your diabetes self-care schedule | 5.50 (1.93) | 5.75 (1.01) | -.57 | 42 |
| Criticize you for not recording the results of glucose tests | 4.21 (1.93) | 3.96 (1.61) | .44 | 39 |
| Eat at the same time that you do | 5.56 (1.21) | 5.39 (1.23) | .44 | 42 |
| Exercise with you | 5.33 (1.11) | 4.59 (1.65) | 1.55 | 40 |
| Let you sleep late rather than getting up to take your diabetes medication | 4.33 (2.26) | 3.81 (1.79) | .82 | 39 |
| Buy you things containing sugar to carry with you in case of a hypoglycemic reaction | 6.12 (1.67) | 5.70 (1.61) | .82 | 41 |
| Eat foods that are not part of your diabetic diet | 3.80 (2.08) | 4.08 (1.74) | -.46 | 39 |

# CHAPTER V

## SUMMARY AND CONCLUSIONS

The goal of this study was to examine the relationship between general and diabetes specific family functioning, general and diabetes specific health-related quality of life, and metabolic control in order to identify areas for intervention that can improve medical and psychosocial outcomes for children and adolescents with type 1 diabetes. As hypothesized, there was a significant relationship for children with metabolic control predicting children's reports of physical health-related quality of life. Children with worse metabolic control reported a lower physical health-related quality of life. There was not a significant relationship, however, with parent or combined reports, suggesting that children may be a more reliable source for reporting how their metabolic control relates to how they feel physically (e.g., energy level, physical activities). It was also hypothesized that metabolic control would correlate significantly with both general health-related quality of life and diabetes specific health-related quality of life. Results supported this hypothesis with all reports (child, parent, and combined), demonstrating that in this sample, children's psychological health-related quality of life, including their feelings, relationships, school performance, and diabetes treatment, has an impact on their blood sugar control and vice versa.

Due to the small number of participants in this study, the proposed model could not be tested and separate regression analyses were done for each path. Results from these regression analyses did not support all hypotheses. Contrary to the hypothesis, age was not found to be a predictor for any of the outcomes and was therefore not used in the subsequent regression analyses. Mother's educational level, however, was found to be a

predictor and was used as a control variable in the first step of each regression analysis. It was hypothesized that general family functioning, as rated by the Family Relationship Index from the Family Environment Scale, would be predictive of general and diabetes specific health-related quality of life and metabolic control. Only one report found significance; child reported general family functioning was found to account for an additional 11% of the variance in general health-related quality of life after mother's educational level. This further shows the importance of obtaining children's views on their own and their family's functioning. Contrary to hypotheses, no further reports of general family functioning were found to be significant predictors for general or diabetes specific health-related quality of life or metabolic control. It was also hypothesized that diabetes specific family functioning, as rated by the Diabetes Family Behavior Checklist, would be predictive of general and diabetes specific health-related quality of life and metabolic control. The Diabetes Family Behavior Checklist had two separate scales, the non-supportive and supportive; the non-supportive scale was the only one found to have some significant results. Parent reported diabetes specific family functioning on the non-supportive scale accounted for an additional 29% of the variance in general health-related quality of life after mother's educational level and in separate analyses, child report accounted for an additional 11% of variance and combined child and parent report accounted for an additional 15% of the variance.

These results indicate that parents who view themselves and children who view their parents as non-supportive with diabetes care have a negative impact on the child's general health-related quality of life. Additionally, parent report on the non-supportive scale accounted for an additional 13% of the variance in diabetes-specific health-related

quality of life after mother's educational level, suggesting that parents who view themselves as non-supportive with their child's diabetes care rate their child's diabetes specific health-related quality of life as being lower. Surprisingly and contrary to the hypothesis, the supportive scale was negatively correlated with both general health-related quality of life and diabetes specific health-related quality of life. It is possible that too much support has a negative effect on children, making them feel as though they have no control and thus affecting their health-related quality of life. Parental over-involvement has been shown to have negative effects, with collaborative involvement showing the best outcomes for metabolic control and emotional adjustment (Wiebe, et al., 2005; Berg, et al., 2007).

Some results indicated a nonsignificant relationship but detected small effect sizes, indicating significance may have been found with a larger sample. Small effect sizes were found for some demographic variables including both child and combined report for prediction of general health-related quality of life from age, child report for prediction of diabetes specific quality of life from age, and child report of both general and diabetes specific health-related quality of life from duration of diabetes. Small effect sizes were also detected with child report for prediction of diabetes specific quality of life from general family functioning, parent report for prediction of metabolic control from general family functioning, combined report for prediction of diabetes specific health-related quality of life from diabetes specific family functioning, and child report for prediction of metabolic control from diabetes specific family functioning. Additional small effect sizes were detected for some combined reports, but these were more likely a result of the strong relationship of the child report; these included prediction of physical

health-related quality of life from metabolic control and prediction of general health-related quality of life from general family functioning.

### *Study Limitations*

The biggest limitation to this study was the small sample size. It was proposed that 128 participants were needed to obtain enough power, but only 45 participants were recruited. Due to the small sample size, the proposed model could not be tested. There was also low diversity within the sample, including Recent A1c used to obtain a measure of metabolic control, and this may have prevented finding significant results where there may be significance in the larger population. It may have been more beneficial to collapse the groups for mother's educational level; due to the small sample size, some groups had low numbers. Collapsing these levels would have provided a better indication as to how mother's educational level related to the outcomes in this sample. Given a larger sample size, the five levels of mother's education could be used. Many of the confidence intervals in these analyses went from a negative lower bound number to a positive upper bound number, indicating that the model tested was not good. When this occurs, it indicates that in some samples, the predictor has a negative relationship to the outcome while in others, it has a positive relationship. Significant results that have negative to positive confidence intervals should be interpreted with caution.

### *Implications*

Despite the problems in this study, there are important implications. This study demonstrated the importance of obtaining both child and parent perspectives on issues regarding general family functioning and health-related quality of life and diabetes specific family functioning and health-related quality of life. There were instances in this

sample where the child's report indicated significant results, while the parent's report did not, and vice versa. Additionally, many of the combined reports were not significant, or in the cases where significance was detected, it was mostly due to the strong relationship of either the parent or child report. These results suggest that parent and child reports should be analyzed separately and not combined; important relationships may not be detected if only combined reports are used. The significance of mother's educational level on the outcome variables is also an important implication. Diabetes management is a difficult and often confusing task and it seems that children whose mothers have a lower level of completed education are at higher risk for adverse outcomes. This can be a potential point of intervention; mothers whose educational levels are lower may need additional training and support regarding diabetes management.

The importance of assessing health-related quality of life was also demonstrated with the significant correlations between metabolic control and both general and diabetes specific health-related quality of life. It is important for physicians to be aware of the physical consequences of poor metabolic control as well as the emotional effects. The study also demonstrated the importance of examining the family dynamic, especially surrounding diabetes care. The non-supportive behaviors of parents, as reported by parents, had a negative impact on their children in this sample. These behaviors include nagging the child to keep up with the diabetes regimen and criticizing the child when he or she does not do it. This can become especially important in adolescence when children and parents try to find the balance of the child wanting more independence. Parent resource groups could be a solution to help this transition of diabetes management

and future studies may want to focus on this transition period and helping the child achieve good metabolic control and maintain a good health-related quality of life.

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