UNDERSTANDING THE STRESSFUL CHALLENGES OF ADOLESCENT TYPE 1 DIABETES MANAGEMENT IN CAUCASIAN AND LATINO YOUTH

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DEDICATION

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UNDERSTANDING THE STRESSFUL CHALLENGES OF ADOLESCENT TYPE 1 DIABETES MANAGEMENT IN CAUCASIAN AND LATINO YOUTH

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Abstract

BACKGROUND: Type 1 diabetes management poses many challenges and is a potential source of stress among adolescents with diabetes and their families. In primarily Caucasian samples, diabetes management outcomes (e.g., metabolic control) deteriorate across adolescence. A growing literature indicates that Latino youth have poorer diabetes control than do Caucasian youth. The broad objective of the present study was to examine ethnic differences in the experience and effects of stress on type 1 diabetes management during adolescence.

SUBJECTS: Participants were Caucasian and Latina mothers and adolescents with type I diabetes (N=118 dyads; 48% Latino; 54% female; 10 to 15 years old; illness duration > 1 year; 25% on insulin pump). Adolescents were between 10 and 15 years of age (M = 12.74, SD = 1.64).

METHOD: Demographic information was collected through maternal report, geographic identifiers from available census data, and medical records. Adolescents completed surveys measuring the occurrence of different types of stressful events relevant to a diverse population of Latino and Caucasian youth (i.e., stress dimensions of family conflict, peer hassles, school hassles, and economic stress), treatment adherence, and depressive symptoms. Metabolic control was determined from HbA1c recorded in medical records. Socio-demographic information was collected through a combination of maternal report and census tract data.

RESULTS: On average, Latino participants were of a lower socioeconomic status (SES) than Caucasian participants. However, there were not significant ethnic group differences in terms of adolescent age, adolescent gender, illness duration, or insulin pump status. There were also no ethnic differences on adolescent report of different types of stress. In the full sample, heightened

levels of each type of stress were associated with indicators of poorer diabetes management and poorer psychosocial adjustment. Hierarchical regression analysis revealed that the stresses of peer hassles, school problems, and family conflict were each associated with poorer outcomes regardless of ethnicity. However, ethnicity moderated associations of economic stress with both adherence and depressive symptoms. Economic stress was associated with poorer adherence and greater depression in Caucasian youth, but was unrelated in Latino youth.

DISCUSSION: Latino and Caucasian youth in the sample for this study did not show significant differences in their report of the experience of stress, but Latino youth appeared resilient against the adversity of economic stress. This interaction pattern is consistent with the Latino paradox. Understanding resiliency factors in diverse populations may assist health care professionals in providing effective and culturally sensitive interventions.

Keywords: type 1 diabetes, adolescence, Latino, Caucasian, stress, depression, adherence, metabolic control.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

SES – Socioeconomic Status

MESA – Multicultural Events Scale for Adolescents

CDI – Children's Depression Inventory

SCI – Self Care Inventory

HbA1c – Glycosylated hemoglobin, indicator of metabolic control

CHAPTER ONE

Introduction

Type 1 diabetes management poses many challenges and is a potential source of stress among adolescents with diabetes and their families (Beveridge et al., 2005). In primarily Caucasian samples, diabetes management outcomes (e.g., metabolic control) clearly deteriorate across adolescence (Seiffge-Krenkem Laursen, Dickson, & Hartl, 2013; Jacobsen et al., 1990). Such deterioration is of great concern given the long-term complications that can occur with mismanagement (Quittner et al., 2008; Silverstein et al., 2005). Poor management of diabetes that emerges during adolescence is sustained into adulthood (Bryden et al., 2001), and is associated with elevations in blood glucose levels that contribute to the development of serious long-term complications such as neuropathy, retinopathy, and renal disease (The Diabetes Control and Complications Trail Research Group (DCCT), 1994). Thus, understanding factors that contribute to poor diabetes management among youth with type 1 diabetes is quite important.

Stress may be an important factor for enhancing our understanding of adolescent diabetes management. Diabetes management poses numerous stressful challenges for children and parents as they try to manage a serious illness in the context of normative adolescent life-changes (e.g., developing autonomy, changing parent-child relationships, spending increasing time away from home with friends, managing the physiological changes of puberty) (Silverstein et al., 2005). Indeed, the experience of stressful life events is associated with poorer diabetes management in youth with diabetes. Both general life stress and diabetes specific hassles have been associated with poorer metabolic control (Berlin, Rabideau, & Hains, 2012), poorer adherence (Silverstein

et al., 2005), and heightened psychological distress (Hood et al., 2006) among adolescents with type 1 diabetes.

Although limited research has been conducted with minority youth with type 1 diabetes, a growing literature indicates that Latino youth have poorer diabetes control than do Caucasian youth (Gallegos-Macias et al., 2003; Wang, Wiebe, & White, 2011). Gallegos-Macias and colleagues (2003) found that Latino youth with type 1 diabetes typically display higher blood glucose and HbA1c levels when compared to Caucasian youth. Understanding the factors that contribute to difficulties in diabetes management across ethnically diverse populations is important for the development of culturally relevant interventions to promote better management of diabetes across diverse populations.

The broad objective of the present study was to examine ethnic differences in the experience and effects of stress on type 1 diabetes management during adolescence. There is limited research on stress among Latino youth in general, and no research has examined stress in the context of diabetes management among Latino youth. There are several ways in which stress may be experienced differently across Caucasian and Latino youth. First, they may differ in the level and types of stressors that are experienced. Second, there may be differences in the association of these stress features with different diabetes outcomes.

One factor that may contribute to differences in stressors is socioeconomic status, which has been found to be a contributing factor to health outcomes among the general population in the United States (Barrera et al., 2002; Prelow, Danoff-Burg, Swenson, & Pulgiano, 2004). In the United States, Latino individuals are, on average, more economically disadvantaged than their Caucasian counterparts (Ruiz & Steffen, 2011). Therefore, it would be expected that

Latinos who are economically disadvantaged might have higher levels of general stress and diabetes specific hassles. Research has found that individuals from lower SES backgrounds (e.g., lower income level, lower education level) were at a higher risk of poorer glycemic control and various complications that can occur with diabetes (e.g., neuropathy, end-stage renal disease, coronary artery disease) than individuals from higher SES backgrounds (Secrest et al., 2011; Helgeson et al., 2010).

A separate body of research supporting the epidemiologic phenomenon known as the Hispanic Paradox argues that Latino individuals show a tendency to maintain resilience in the face of economic stressors when compared to Caucasian individuals (Franzini, Ribble, & Keddie, 2001; Ruiz, Steffen, & Smith, 2013). The nature of these ethnic differences is not completely known. However, it is important to understand and study ethnic differences between Latino and Caucasian youth because these differences between cultures may be associated with different diabetes outcomes.

The general objective of this study was to explore the role of stress in understanding how Latino and Caucasian youth manage type 1 diabetes during adolescence. The specific aims were to examine whether Latino and Caucasian adolescents with type 1 diabetes experience different levels or types of general life stress, and whether there are ethnic differences in how these different features of stress are related to diabetes outcomes (i.e., adherence, metabolic control, and depressive symptoms).

CHAPTER TWO

Review of the Literature

Prevalence of Type 1 Diabetes

Type 1 diabetes is one of the most common childhood chronic illnesses (LaPorte, Matsushima, & Chang, 1995). It is estimated to affect two in every one thousand children in the United States annually (Bell et al., 2009), with a majority of diagnoses occurring before age 18 (Daneman, 2006; Kerig & Wenar, 2006). Research indicates that the prevalence of diabetes varies across ethnicity, age, and geographic location (Daneman, 2006). In the pediatric population, type 1 diabetes is most prevalent among individuals of northern European descent (Epstein, Atkinson, & Maclaren, 1994; Karvonen et al., 2000; Bell et al., 2009) followed by African American and Latino youth (Gregory, Moore, & Simmons, 2013). However, recent research projects that by 2050, prevalence rates of diabetes (both type 1 and 2) will be the highest for Latinos (127%), followed by African Americans (107%) and Caucasian youths (99%) (Narayan, Boyle, Geiss, Saaddine, & Thompson, 2006).

The global prevalence of diabetes has been increasing annually and is projected to continue increasing across all age groups and ethnicities within the next few decades (Wild, Roglic, Green, Sicree, & King, 2004). In addition, the incidence rate of type 1 diabetes is steadily increasing each year (Daneman, 2006; Gregory, Moore, & Simmons, 2013). A recent study of youth with type 1 diabetes in the United States reported an annual incidence rate of 27.5 new cases for every 100,000 children under the age of fourteen (Bell et al., 2009).

Etiology of Type 1 Diabetes

The biological mechanism of type 1 diabetes is characterized by autoimmune destruction of insulin-producing pancreatic beta cells, thereby affecting metabolic control (Daneman, 2006; Gregory, Moore, & Simmons, 2013). Insulin is required to metabolize carbohydrates and regulate blood glucose levels (Alberti & Zimmet, 1998; Kerig & Wenar, 2006). Without insulin, there is no way for the body to metabolize carbohydrates for energy. Consequently, glucose builds in the blood stream, reducing metabolic control, while the body starves. Exogenous sources of insulin must then be provided daily in order to survive (Alberti & Zimmet, 1998).

Management of Type 1 Diabetes

Once individuals have been diagnosed with type 1 diabetes, they are considered to have a chronic disease that must be managed for the remainder of the lifespan (Epstein, Atkinson, & Maclaren, 1994). Ongoing medical care and self-management must occur ("Standards of Medical Care in Diabetes – 2013"; Epstein, Atkinson, & Maclaren, 1994) with the goal of maintaining blood glucose levels as close to a normal range as possible. Efforts are made to minimize and manage hypoglycemia (i.e., low blood glucose levels) and hyperglycemia (i.e., high blood glucose levels) (Daneman, 2006; Kerig & Wenar, 2006; Silverstein et al., 2005) through external injections of insulin delivered through an insulin pump or multiple daily injections (Silverstein et al., 2005). In order to maintain satisfactory diabetes management, injections are typically required up to four or more times per day, with increases in insulin being necessary especially in pubertal children who experience fluctuating hormone levels (Kerig & Wenar, 2006; Silverstein et al., 2005; Greening, Stoppelbein, Konishi, Jordan, & Moll, 2007).

Management of type 1 diabetes extends beyond simply injecting insulin multiple times daily. The timing and amount of insulin injected must be coordinated with and adjusted for food

intake, exercise, and information about current blood glucose levels obtained from blood glucose monitoring procedures (Silverstein et al., 2005 & Tamborlane & Ahern, 1997). Individuals with type 1 diabetes are recommended to refrain from the consumption of foods that are high in simple carbohydrates (e.g., sucrose, glucose, and fructose) (Garg & Barnett, 2003), and to adjust insulin doses to be congruent with the amount of carbohydrates that are consumed (Silverstein et al., 2005). Similarly, when exercising, individuals must keep in mind that the amount of energy exerted can directly impact blood glucose levels, potentially altering the insulin dose amount and frequency (Tamborlane & Ahern, 1997). Blood glucose monitoring is an important factor to diabetes management and the efficient regulation of blood glucose levels, with more frequent blood glucose monitoring having been associated with better glycemic control (Helgeson et al., 2011).

Complications that Occur with Mismanagement of Type 1 Diabetes

When children and adolescents with type 1 diabetes maintain poor adherence to their treatment plans, the possibility of developing various short-term or long-term complications is increased (Quittner et al., 2008). Some of the short-term complications that can occur when diabetes is not managed correctly include hyperglycemia, hypoglycemia, weight loss, and ketoacidosis (Silverstein et al., 2005). Hyperglycemia occurs when there is a highly elevated concentration of glucose in the blood, which can negatively affect insulin secretion and increase insulin sensitivity (Aubert, 1995). Experiencing chronic hyperglycemia has been associated with increased risk of developing renal and retinal microvascular disease (Aubert, 1995; The Diabetes Control and Complications Trial [DCCT], 1994). Diabetic ketoacidosis occurs when there is a relative deficiency of insulin that the body needs to metabolize carbohydrates for energy.

Without insulin, the body breaks down fats for energy instead (Kreisberg, 1978). Ketones and acetoacidic acids are produced as byproducts of this process. The elevation of ketones creates a level of toxicity in the body that can result in diabetic coma or even death if severe enough (Kreisberg, 1978; American Diabetes Association, 2013). In contrast, hypoglycemia occurs when glucose concentrations in the body are too low. Hypoglycemia can be caused by inefficient insulin dosages and has been associated with long-term consequences including neurological impairments, microvascular complications, and morbidity in individuals with type 1 diabetes (Cryer, Davis, & Shamoon, 2003). Therefore, maintaining stable blood glucose levels is essential to basic diabetes treatment and health. The standard way to measure metabolic control is through the use of HbA1c tests, which provide results for average glucose levels over the span of several months ("Standards of Medical Care in Diabetes – 2013"). Blood glucose levels can also be self-monitored by frequent daily readings via a blood glucose meter, which helps individuals keep track of their blood glucose levels and allows them to make treatment regimen changes accordingly.

Mismanagement of type 1 diabetes and experiencing chronically elevated blood glucose levels have been identified as significant contributors to the development of serious long-term complications such as neuropathy, retinopathy, and renal disease (The Diabetes Control and Complications Trial [DCCT], 1994). Other long-term negative health consequences from poorly managed blood glucose levels include a higher risk of developing cardiovascular disease, nervous system damage, gum disease, and various autoimmune disorders (Daneman, 2006; Klein, Klein, & Moss, 1996; Silverstein et al., 2005; Travis et al., 1987). Given the severity of consequences when diabetes is mismanaged, and the fact that youth with diabetes have been

found to have a harder time meeting the recommended levels of metabolic control than adults (Anderson, Ho, Brackett, Finkelstein, & Laffel, 1997; Greening et al., 2007), it is important to understand the major factors that contribute to poor diabetes management among youth with type 1 diabetes in order to avoid negative health outcomes.

Type 1 Diabetes Management During Adolescence

There are difficulties that occur when managing type 1 diabetes during adolescence. To maintain diabetes care, adolescents must learn how to adapt to constantly changing insulin requirements that occur as a result of physical changes in the body (Silverstein et al., 2005). Additionally, youth with type 1 diabetes must learn to keep up with the demands of diabetes management as responsibilities are transferred from caregiver to child, and the adolescent becomes more autonomous (Kaugars, Kichler, & Alemzadeh, 2011; Silverstein et al., 2005). These issues associated with diabetes management during adolescence are especially salient considering that the peak onset of type 1 diabetes for many children occurs during puberty (Kerig & Wenar, 2006).

Adolescents who have been diagnosed with chronic illnesses are likely to experience difficulties in maintaining adherence to a regular treatment plan (Quittner et al., 2008). Past research looking at primarily Caucasian samples has found that diabetes management outcomes (e.g., metabolic control) clearly deteriorate across adolescence (Seiffge-Krenke, Laursen, Dickson, & Hartl, 2013; Jacobson et al., 1990), and have been associated with poorer adherence (Greening et al., 2007). Longitudinal studies of adolescent type 1 diabetes management have found that adherence to diabetes management (King, Berg, Butner, Butler, & Wiebe, 2013) and metabolic control (Helgeson, Siminerio, Escobar, & Becker, 2009; Helgeson et al., 2010)

deteriorated over time. Another longitudinal study suggested that type 1 diabetes was found to be comorbid with several psychiatric disorders such as depression and anxiety (Kovacs, Obrosky, Goldston, & Bonar, 1997). This is especially relevant considering that depression has been linked to poorer metabolic control (Hood et al., 2012). Poor diabetes management that is evident during adolescence has been shown to be likely sustained into adulthood (Bryden et al., 2001) and has been associated with elevated blood glucose levels, marking adolescence as a crucial developmental period for understanding type 1 diabetes management.

There are several factors contributing to the high level of difficulty that adolescents experience when managing their diabetes. Such difficulties are not surprising when one considers multiple changes that accompany the transition out of childhood into adolescence. There are a number of normative developmental changes that take place, such as developing more sophisticated cognitive skills, coping with physical body changes accompanying puberty, establishing a heightened level of social maturity, developing a personal sense of self-identity, and striving for peer acceptance (Kerig & Wenar, 2006; Silverstein et al., 2005). This is also the time in development when individuals are expected to take on more autonomy when handling different life situations (Grey & Tamborlane, 2003). This assumption of responsibility is especially critical given that adolescence is the peak time when youth desire peer acceptance, and when their personal identity is vulnerable and not yet fully established (Kerig & Wenar, 2006).

Stress and Adolescent Type 1 Diabetes

Stress may be an important factor for enhancing our understanding of adolescent diabetes management. There are several types of stressors that can influence the life of a young person

with or without type 1 diabetes. Some of the normative stressors that occur in adolescence include difficulties associated with interpersonal conflict, family economic strain, developmental change, academic performance, and peer acceptance (Compas et al., 2001; Kerig & Wenar, 2006). When looking specifically at children and adolescents, there is a growing body of literature supporting the connection between stressful events and physical and psychological well-being (Alva & De los Reyes, 1999; Compas, Malcarne, & Fondacaro, 1988; Pinquart & Shen, 2011).

Past research has shown that experiencing one or more stressful life event(s) can alter how an individual perceives their chronic illness (Pearlin & Schooler, 1978 as cited in Felton & Revenson, 1984). Type 1 diabetes management itself poses many challenges and is a potential source of stress among adolescents with diabetes (Beveridge et al., 2005). Both stressful life events and stress accompanying diabetes management have been associated with poorer metabolic control (Berlin, Rabideau, & Hains, 2012), poorer adherence (Silverstein et al., 2005), and heightened psychological distress (Hood et al., 2006) among adolescents with type 1 diabetes. In a longitudinal study on adolescents with type 1 diabetes, stressful life events were associated with decreased blood glucose monitoring (Helgeson et al., 2011). In the literature there is also support for a positive correlation between psychosocial stress and depressive symptoms, especially during adolescence (Grant et al., 2004).

Some of the characteristic daily stressors that individuals with type 1 diabetes typically experience include the demands and stress that occur with continuous management of metabolic control, nutrition intake, insulin injections, and blood glucose testing (Beveridge et al., 2005). In addition, type 1 diabetes can also cause stress for other family members. It is important to

consider the range of stressful events when thinking about how type 1 diabetes may affect the daily functioning of adolescents with diabetes, especially because the experience of stressful events can negatively impact health and adherence (Delamater et al., 1987).

Youth with diabetes may experience conflict due to feeling different from their peers that results from persistent concern over self-monitoring and management of their diabetes (Anderson, Wolfsdorf, & Jacobsen, 1994). The idea of being different from one's peers may result in the individual experiencing increased sensitivity towards peers' views of their illness, decreased self-confidence, and the possible development of negative body image issues (Anderson et al., 1994). One of the main areas where adolescents with type 1 diabetes are greatly affected is in the context of public and social functions (i.e., school) (Travis et al., 1987). Often times, insulin injections must be administered while at school, which can cause stress if the child feels singled out from his or her classmates. In summary, diabetes management is a difficult and challenging task during childhood and adolescence, and these stressful challenges may play a role in the difficulties of managing diabetes during this developmental period.

Transitioning from childhood to adolescence has been associated with increased changes in the family dynamic and increased levels of family conflict (Eccles et al., 1993; Smetana, 1989; Montemayor & Hanson, 1985). These struggles are partly due to the adolescent beginning to develop a heightened sense of personal responsibility and autonomy, which may lead to challenging of parental authority (Eccles et al., 1993; Smetana, 1989). Some of the main sources of family conflict are centered on issues of noncompliance and disagreement in adolescent choice of social activities and interpersonal relationships (Smetana, 1989; Montemayor & Hanson, 1985).

Family conflict should be considered as one important dimension of stress that can negatively impact diabetes management during adolescence. As adolescents with type 1 diabetes transition out of childhood, they are given more diabetes management responsibilities in addition to the normative challenges that accompany their transition into puberty (Ingerski, Anderson, & Hood, 2010). This transition period has been linked to a decrease in blood glucose monitoring and poorer glycemic control (Ingerski, Anderson, & Hood, 2010). Experiencing general family conflict and diabetes-specific conflict have been linked to glycemic control, with increased levels of conflict associated with heightened HbA1c levels (Anderson et al., 2002; Anderson, 2004; Anderson, Holmbeck, & Laffel, 2009; Williams, Laffel, & Hood, 2009) and less frequent blood glucose monitoring (Anderson et al., 2002; Ingerski, Anderson, & Hood, 2010). In a study observing negative responses and affect of adolescents with type 1 diabetes, negative emotion linked to blood glucose monitoring was associated with heightened family conflict and poorer glycemic control (Gray, Dolan, & Hood, 2013).

Diabetes Management in Latino Youth

Latinos in the United States are comprised of a diverse group of individuals who have varying cultural values and represent roughly twenty-three different nationalities and twelve different languages (Ruiz & Steffen, 2011). The terms “Hispanic” and “Latino” are often used interchangeably throughout the literature. In order to maintain consistency, this paper will use the term “Latino.” Recent datum indicates that Latinos make up the largest minority population in the United States (Ruiz & Steffen, 2011). Almost half of all Latinos in the United States are highly concentrated in either Texas or California (Ruiz & Steffen, 2011). Latinos have been found to have the lowest median income in comparison to other ethnic groups in the United

States (Ruiz & Steffen, 2011). Between 2000 and 2025, the Latino population is estimated to grow by 273% (Vega, Rodriguez, & Gruskin, 2009), with roughly 30% of all children in the United States expected to be of Latino descent (Ruiz & Steffen, 2011).

Although there is limited research on minority youth with type 1 diabetes, a small but growing literature suggests that Latino youth have poorer type 1 diabetes management than Caucasian youth (Gallegos-Macias et al., 2003; Patino, Sanchez, Eidson, & Delamater, 2005; Wang, Wiebe, & White, 2011). In a recent study looking at diabetes management in Latino youth, poorer diabetes outcomes were associated with longer amount of time living in the United States (i.e., more generations of the family living in the United States) (Hsin et al., 2010). The mechanisms behind these suggested discrepancies in Latino and Caucasian diabetic youth are not fully known. Understanding more about the Latino population with type 1 diabetes in the United States and about Latino cultural values and traditions may provide insight into diabetes health outcome disparities, and facilitate the development of culturally relevant interventions.

Latino Cultural and Traditional Values and Sources of Stress. Understanding the impact of one's culture and family dynamics has been suggested to be an important factor for understanding the context and behavior of each individual (Szapocnik & Kurtines, 1993). Latino culture is comprised of several different cultural values that help shape Latino behaviors and beliefs. Overall, the Latino culture is considered to be collectivistic; that is, they place a higher emphasis on maintaining the good of the group rather than placing the needs of each individual first (Ruiz & Steffen, 2011). Some general cultural values that are endorsed in Latino culture include: maintaining loyalty to the family, placing the values of the family above individual

needs, and demonstrating respect towards elders in the family and community (Halgunseth, Ispa, & Rudy, 2006).

One of the prominent challenges for Latino families in the United States is to successfully integrate traditional Latino cultural values with mainstream Western values and customs. Older family members are likely to hold tighter to their native cultural values, while younger family members tend to assimilate more quickly to mainstream culture (Sluzki, 1979; Szapocnik & Kurtines, 1993). In Latino culture, the concept of familismo, or maintaining strong ties with family and putting the family first, is highly regarded (Halgunseth, Ispa, & Rudy, 2006; Franzini, Ribble, & Keddie, 2001). However, exposure to two different sets of cultural values can lead to increased family conflict as the older family members strive to preserve traditional values (e.g., maintaining closeness to the family unit), while younger family members may be pushing for more autonomy (Szapocnik & Kurtines, 1993). As a result of conflicting pressure to choose allegiance to one culture over another, family roles may be altered, support among family members may decrease, relationships may become strained, and children may lose sight of the traditional cultural values of their parents (Alva & de Los Reyes, 1999; Sluzki, 1979; Szapocnik & Kurtines, 1993).

There are different kinds of stress (i.e., economic stress, family conflict, and school hassles) that can affect Latino youth, and these sources of stress may be associated with diabetes management. Increased levels of family conflict may influence Latino families to experience heightened levels of stress. A research study looking specifically at Mexican origin adolescents found adolescents were most likely to report stressors regarding family events over other types of stressors (Liu, Gonzales, Fernandez, Millsap, & Dumka, 2011). More specifically, Mexican

origin adolescents' tradition and culture may influence them to be more involved in solving family problems and may encourage heightened participation in family stressful events (Liu et al., 2011). Latino parents may experience additional stressors related to language, especially if they have difficulty speaking or understanding English. In select cases, fear associated with potential threats of deportation may cause immense stress within the family (Dumka, Gonzales, Wood, & Formoso, 1998).

As a result of being exposed to two different sets of cultural values and norms, Latino children may also experience difficulties as they learn to interact with peers at school and their parents at home, who may represent different cultural values (Sluzki, 1979). Latino cultural values such as personalismo (i.e., being able to build warm interpersonal relationships) and simpatia (i.e., displaying kindness to others) (Ruiz & Steffen, 2011) may start to be viewed as less important by adolescents as they become more adapted to mainstream culture. Consequently, tension may arise as adolescents attempt to combine values learned from their peers with conflicting cultural values practiced at home.

Being exposed to two different sets of cultural values may also present difficulties for the adolescent outside of the home. Being the only individual from a different culture can cause adolescents to stand out from their peers, which can result in rejection from peers. Children who are rejected by their peers are at higher risk for failing academically compared to children who are more accepted by their peers (Wentzel, 1991). This may be truer in environments where there are smaller Latino populations, such that the adolescent is visibly a part of the minority group.

Research on Latino groups in the United States has shown that Latino individuals, on average, are more economically disadvantaged than their Caucasian counterparts (Ruiz & Steffen, 2011). Therefore, they may be at an increased risk of exposure to health risk factors related to economic stress and poverty (Angel & Guarnaccia, 1989). Latino adolescents who are more proficient in English than their parents may be forced to become more involved in financial issues and other familial sources of stress out of necessity to act as a translator/interpreter for their parents (Alva & de Los Reyes, 1999).

Taken together, the cultural and socioeconomic context of Latino youth may create a stressful social environment in which they must manage a serious illness such as type 1 diabetes. There are reasons to expect that Latino adolescents may experience higher levels of economic stress, family stress, and school and peer hassles relative to Caucasian adolescents. One goal of the present study was to examine whether Latino youth report different levels of general stress relative to their Caucasian counterparts.

Latino Cultural Values and the Health Effects of Stress. Despite the difficulties outlined for adolescents growing up with clashing views of Latino and mainstream cultural values, Latino culture may also provide additional resources for the family and adolescent. For instance, families may use their Latino cultural values as a source of support, especially with the cultural value of familismo, where family members value putting the needs of the family above individual needs (Halgunseth, Ispa, & Rudy, 2006). Maintaining strong family support may serve as a buffer against other potential difficulties and issues experienced by family members. Hsin and colleagues (2010) found that family support among Latino youth with diabetes was a resource associated with better diabetes management. This is important given that poorer

relationships with parents and less diabetes support have been associated with decreased blood glucose monitoring in adolescence with diabetes (Helgeson et al., 2011; Helgeson, Siminerio, Escobar, & Becker, 2009). By examining whether Latino culture and traditional values alter the effects of stress on diabetes outcomes, our understanding behind the causes of the potential discrepancies in Latino and Caucasian diabetes management outcomes becomes more salient.

In the literature, socioeconomic status (SES) often refers to a culmination of factors including education level, occupation status, and income (Adler & Newman, 2002; Ruiz, Prather, & Steffen, 2012). Lower SES has been linked to a variety of health problems among the general population in the United States (Adler & Newman, 2002; Barrera et al., 2002; Prelow, Danoff-Burg, Swenson, & Pulgiano, 2004). Belonging to a lower SES can result in increased exposure to poorer environmental conditions and decreased access to healthcare resources, which can also have negative effects on one's health (Adler & Newman, 2002). In addition, lower SES combined with chronic stress may increase the risk of morbidity or mortality (Adler & Newman, 2002). It is important to note that the relationship between SES and health is linear across the full range of SES (Adler et al. 1994). Socioeconomic status has been negatively correlated with several types of chronic illnesses, with individuals from lower SES experiencing more problems in management of their chronic illnesses than individuals with higher SES (Secrest, Costacou, Gutelius, Miller, Songer, & Orchard, 2011). Research has found that individuals from lower SES backgrounds (e.g., lower income level, lower education level) were at a higher risk of poorer glycemic control and various complications that can occur with diabetes (e.g., neuropathy, end-stage renal disease, coronary artery disease) than individuals from higher SES backgrounds (Secrest et al., 2011; Helgeson et al., 2010; Drew et al., 2011).

There are ethnic disparities in SES in the United States, with Latinos at a higher risk for being economically disadvantaged in comparison to other ethnic groups (Ruiz & Steffen, 2011). This may account for some of the ethnic disparities found in diabetes management. Lower SES has specifically been associated with poorer diabetes management in Latino youth compared to Caucasian youth (Gallegos-Macias et al., 2003). Wang, Wiebe, and White (2011) recently found that poorer levels of metabolic control among Latino versus Caucasian youth at the beginning of adolescence disappeared when family income differences were statistically controlled. Belonging to a lower SES and a minority group increases one's chances of being socially disadvantaged and has been associated with experiencing increased levels of chronic stress (Goodman, McEwan, Dolan, Schafer-Kalkoff, & Adler, 2005). There is also evidence that lower income specifically undermines the quality of diabetes management in youth with type 1 diabetes (Drew et al. 2011).

Although there is evidence that Latinos experience health disparities related to their lower SES, the epidemiologic phenomenon known as the Latino Paradox complicates the interpretation of these findings. The Latino Paradox argues that Latino individuals show a tendency to maintain resilience (e.g., experience lower mortality rates) in the face of economic stressors when compared to Caucasian individuals (Franzini, Ribble, & Keddie, 2001; Ruiz, Steffen, & Smith, 2013). In the only study we are aware of examining this phenomenon in youth with type 1 diabetes, Wang et al. (2011) found that Latino ethnicity moderated associations between SES and trajectories of deterioration in metabolic control across adolescence. Specifically, Latino youth living in poorer neighborhoods showed slower rates of deterioration in metabolic control across the adolescent years than Latino youth living in wealthier neighborhoods; the reverse

pattern was observed among their Caucasian counterparts. Thus, although Latino populations in the United States are socioeconomically disadvantaged, have lower average education levels, and lower health insurance rates (Abraido-Lanza, Dohrenwend, Ng-Mak, & Turner, 1999; Markides & Eschbach, 2005), there is evidence of resilience in the face of these disadvantages. The nature of these health disparities between Latino and Caucasian groups is not well understood. The present study examined whether different experiences of and responses to stress across Caucasian and Latino youth with type 1 diabetes may provide some insights into this important phenomenon.

Study Objective and Study Aims

The general objective of this study was to explore the role of stress in understanding how Latino and Caucasian youth manage type 1 diabetes during adolescence. The specific aims were to examine: 1) whether there are ethnic differences in reported levels of different types of general life stress and 2) whether there are ethnic differences in how these types of general stress are related to diabetes management outcomes (i.e., adherence, metabolic control) and psychosocial adjustment (i.e., depressive symptoms). I hypothesized that Latino youth would experience heightened levels of stress in different domains of general life stress and would represent lower average socioeconomic status (e.g., parent education level, family income level) than Caucasian youth. Based on the literature supporting the Latino paradox phenomenon, I further predicted that Latino youth would display fewer negative diabetes health outcomes when they experience higher levels of economic stress. That is, I predicted that ethnicity would moderate associations of economic stress with diabetes-management and psychosocial adjustment. I also tested whether this moderation effect was unique to economic stress, or whether it extended to other

types of stress as well (i.e., family conflict, peer hassles, school problems). I had no a priori hypotheses regarding ethnicity as a moderator of associations between non-economic stress and diabetes-related outcomes.

CHAPTER THREE

Method

Participants

One hundred eighteen adolescents with type 1 diabetes mellitus and their mothers were recruited to participate. Adolescents recruited were between 10 and 15 years of age (M = 12.74, SD = 1.64) from the outpatient Endocrinology clinic at Children's Medical Center of Dallas. Eligibility criteria required adolescents to have been diagnosed with diabetes for at least 1 year (M = 4.12, SD = 2.78), living with their participating mother greater than 50% of the time, and to speak either English or Spanish. Stepmothers and adopted mothers were eligible if they had lived with the adolescent for at least 1 year.

Demographic information was collected through maternal report, geographic identifiers from available census data, and medical records. The sample was comprised of Caucasian (N = 63) and Latino (N = 56) mother-child dyads. This represents 48.2% of the eligible patients who were approached for participation in the study. In the complete sample, 25.4% of participants utilized an insulin pump (30.6% of Caucasian participants, 19.6% of Latino participants). More elaborate descriptive information on the sample as well as ethnic group differences are reported in the results section.

Procedure

All participants provided informed consent or assent during a separate laboratory appointment conducted at the University of Texas Southwestern Medical Center in the clinical psychology department. During the session, mothers and adolescents independently completed a structured interview and online computer questionnaire measures. Trained clinical psychology

graduate students administered the structured interviews and research protocol. Participants who stated discomfort with completing the survey electronically were provided with paper versions of the questionnaires. Each mother-child dyad received a $40 gift card at the end of the one-time assessment.

Measures

General Stress in Latino and Caucasian Adolescents. The Multicultural Events Schedule for Adolescents (MESA) was used to measure the amount of general stress for adolescents. The MESA was originally created and validated to measure the degree of stressful life events in the lives of ethnically and economically diverse minority youths (Liu, Gonzales, Fernandez, Millsap, & Dumka, 2011; Santiago & Wadsworth, 2011). The MESA is an 82-item measure that includes eight subscales that aim to measure general life stressors (i.e., family trouble/change, family conflict, peer hassles, school hassles, economic stress, perceived discrimination, language conflicts, violence/personal victimization). This study utilized four subscales (38 items) from the original measure (i.e., family conflict, peer hassles, school hassles, economic stress) (See Appendix A for complete measure). Previous research has displayed that the psychometric properties of the MESA display adequate test-retest reliability (Prelow, Danoff-Burg, Swenson, & Pulgiano, 2004; Santiago & Wadsworth, 2011), and acceptable reliability and validity across different ethnic groups for each of these subscales (i.e., individuals from African American, European American, and Mexican American ethnic groups) and across different languages (Gonzales, Gunnoe, Samaniego, & Jackson, 1995 as cited in Liu et al., 2011).

Adolescent Depressive Symptoms. The Children's Depression Inventory (CDI) (Kovacs, 1985) was used to measure adolescent depressive symptoms. This is a 27-item scale that determined

the degree of depressive symptoms experienced within the past 2 weeks. Adolescents rated their depressive symptoms over the previous 2 weeks on 3-point scale (*1 = I am sad one in a while, 2 = I am sad many times, 3 = I am sad all the time*) (see Appendix B for complete measure). It yields a total score ranging from 0 to 54, with greater symptomology being reflected in higher scores. The CDI has high internal consistency and test–retest reliability (αs > .71) and is sensitive to difficulties in managing diabetes (e.g., Grey, Davidson, Boland, & Tamborlane, 2001; Kovacs, Goldston, Obrosky, & Bonar, 1997).

Adolescent Report of Adherence. The Self-Care Inventory (SCI) (La Greca et al., 1992) was used to measure different facets of type 1 diabetes adherence or self-management (e.g., blood glucose monitoring, insulin administration, exercise, and diet). Sixteen items were rated by adolescents indicting the extent to which they followed their regimen over the past month (see Appendix C for complete measure). Response options were based on a scale from *1 = Never do it* to *5 = Always did this as recommended without fail*, and ratings were averaged across all items. The SCI has shown adequate internal consistency with a Cronbach's alpha greater than 0.80 and test-retest reliability of greater than 0.77 over two to four week periods (Davis et al., 2001; Delamater et al., 1997; Lewin et al., 2009). The SCI has commonly been used in research with children and adolescents with type 1 diabetes to provide information on adherence.

Metabolic Control. Metabolic control was measured by glycosylated hemoglobin (HbA1c) extracted from medical records. The HbA1c value recorded as part of the routine clinic visit completed nearest to the time of the adolescent's laboratory session was analyzed. HbA1c results display the average blood glucose over the preceding 2 or 3 months, with higher levels indicating poorer metabolic control. Presently, the American Diabetes Association (ADA)

recommends a target HbA1c value of 7.5% in youth between 13 to 19 years of age (American Diabetes Association, 2010).

Analysis Plan

Preliminary analyses were conducted to examine the means, standard deviations, and intercorrelations amongst all study variables. Differences between Caucasian and Latino samples were examined and the need to covary demographic or illness variables was explored prior to the full set of analyses.

Aim 1: To determine whether there were ethnic differences in reported levels of different types of general life stress, independent t-tests were conducted comparing Caucasian and Latino samples on levels of each source of stress.

Aim 2: To determine whether there were ethnic differences in how each source of stress is related to diabetes management, a series of hierarchical linear regression analyses was conducted. In these analyses, the stress variable of interest was centered on its mean, and the cross product of dummy codes for Caucasian versus Latino ethnicity and the centered stress variable was created. The interaction between ethnicity and stress was then tested by placing ethnicity and the relevant centered stress variable in Step 1 and the interaction term in Step 2. Separate analyses were conducted for each relevant stress variable predicting each of the diabetes outcome variables (i.e., adherence and metabolic control) and psychosocial adjustment (i.e., depressive symptoms).

CHAPTER FOUR

Results

Descriptive Information

Descriptive information on demographic and illness related variables in the full sample, and statistical comparisons between Caucasian and Latino participants, are recorded in Table 1. Overall, there were no significant differences between ethnic groups on age, gender, time since diagnosis, and insulin pump usage. Latinos had significantly lower scores on several SES indicators. Specifically, Latina mothers reported lower education levels t (96) = 7.28, $p < .001$ and lower median family income levels t (98) = 4.74, $p = .001$ than Caucasian mothers. In the Latino sample, 42.9% reported that English was the primary language spoken in the home. Twelve percent (N = 6) of Latino participants were classified as 1st generation with both mother and adolescent born inside of the U.S, 57% (N = 28) were classified as 2nd generation with the adolescent born in the U.S. and mother born outside of the U.S., and 31% (N = 15) were classified as 3rd generation with both adolescent and parent born outside of the U.S. Of the Latino participants who reported being born outside of the U.S., 84% reported Mexico as their country of origin. Other countries of origin included two families from Puerto Rico, and one family each from Argentina, Bolivia, El Salvador, and Guatemala. Overall, within the Latino sample the adolescents were mostly classified as 2nd or 3rd generation Mexican American.

Correlation analyses for the overall sample are described in Table 2. SES indicators were associated with multiple aspects of heightened stress. Specifically, higher mother education levels were associated with lower reports of family conflict and economic stress. Higher family income levels were associated with lower reports of peer hassles, school hassles, and economic

stress. Being older was associated with heightened adolescent report of peer hassles. Finally, heightened stress was associated with indicators of poorer diabetes management and psychosocial adjustment. Specifically, a) higher reports of peer hassles, school hassles, and economic stress were related to poorer adherence, b) higher reports of family conflict and economic stress were associated with poorer metabolic control, and higher reports of all types of stress (i.e., family conflict, peer hassles, school hassles, and economic stress) were associated with increased adolescent report of depressive symptoms.

Are there ethnic differences in reported levels of stress?

Aim 1 was examined by using independent samples t tests to compare Caucasian and Latino samples on levels of each source of stress (Table 1). There were no significant differences found between Caucasian and Latino samples on adolescent report of family conflict, peer hassles, school hassles, and economic stress. As mentioned above, Latinos scored lower on several SES indicators. Consistent with these lower scores on SES indicators, there was a trend for Latinos to report higher levels of economic stress than Caucasians.

Are there ethnic differences in the relation of stress with diabetes related outcomes and psychosocial adjustment?

To determine whether there are ethnic differences in how each source of stress is related to diabetes management, a series of hierarchical linear regression analyses was conducted to examine whether ethnicity interacted with each type of stress to predict diabetes management and psychosocial adjustment. Separate analyses were conducted for each relevant stress variable and diabetes outcome variable (i.e., depressive symptoms, adherence, and metabolic control).

Stress as a predictor of depression across ethnicity. As reported in Table 3, three forms of stress (i.e., family conflict, peer hassles, school hassles) significantly predicted higher adolescent report of depressive symptoms when ethnicity was statistically controlled in Step 1. Interestingly, ethnicity significantly moderated the association between economic stress and adolescent reports of depression, but did not interact with other forms of stress to predict depression. The shape of the ethnicity X economic stress interactions was determined by completing the regression equation with dummy coded ethnicity (-1 = Caucasian; 1 = Latino) and the mean $\pm$ 1 SD for the stress variable. From the predicted means displayed in Figure 1, economic stress was associated with heightened depressive symptoms for the Caucasian adolescents but not for the Latino adolescents.

Stress as a predictor of adherence across ethnicity. As reported in Table 4, experiencing school hassles predicted poorer adolescent report of adherence to diabetes management when ethnicity was statistically controlled in Step 1. Again, ethnicity significantly moderated the association between economic stress and adolescent reports of adherence, but did not interact with other forms of stress to predict adherence. The predicted means displayed in Figure 2 show that economic stress was associated with poorer adherence for the Caucasian adolescents, but not for the Latino adolescents.

Stress as a predictor of metabolic control across ethnicity. As reported in Table 5, family conflict and economic stress predicted higher HbA1c levels (poorer metabolic control) when ethnicity was statistically controlled in Step 1. However, ethnicity did not moderate the association between the different forms of stress (i.e., family conflict, peer hassles, school hassles, and economic stress) and metabolic control, including the interaction between economic

stress and ethnicity. The predicted means for the association between economic stress and metabolic control for Caucasians and Latinos indicated that economic stress was associated with higher HbA1c. Although the association appears stronger for Caucasian participants, this ethnic difference was not statistically significant. In addition, the average HbA1c level for the sample (M = 7.50) was above ADA recommendations.

Supplemental Analyses. Because correlations revealed that age, time since diagnosis, and insulin pump status were correlated with some of the outcome variables, I examined whether the above-mentioned associations existed after covarying these variables in Step 1 of the regression analyses. Within these analyses, the interaction effect was found to remain significant when the covariates of age, time since diagnosis, and pump status were included.

A second set of supplemental analyses was conducted to examine the potential role of acculturation in the experience of different types of stress, given that some hypotheses that Latinos would experience heightened stress were based on experiences of acculturation. The acculturation measure (site reference here, or put in methods) took a bicultural perspective such that mother and adolescents' level of identity with each culture (Latino or Caucasian) was measured. A composite score was provided to indicate whether the adolescent identified more with Latino or Caucasian culture. Correlation analyses with the acculturation measure and study variables revealed that identifying with the Latino culture, specifically Mexican origin acculturation was significantly associated with lower mother education levels (r = -0.495, p < .001) and lower family income (r = -0.332, p < .05), as one would expect. Importantly, however, there were no significant correlations between acculturation and levels of stress, adherence, metabolic control, or adolescent report of depressive symptoms (-.271 < r values < .092, .142 < p

values > .986). Thus, in contrast to expectations, acculturation was not linked to experiences of stress, which may partially explain the lack of ethnic differences in levels of stress.

CHAPTER FIVE

Discussion

Study Findings

This study aimed to understand ethnic differences in the experience of stress and to discover whether stress was differentially associated with indicators of diabetes management and psychosocial adjustment across Caucasian and Latino youth with type 1 diabetes. Although I had hypothesized that Latino youth would experience heightened stress, given risks associated with lower SES and experiences related to acculturation, Latino and Caucasian youth in the sample for this study did not show significant differences in their report of stress, although there was a trend for Latino youth to report heightened economic stress. This trend is likely the result of Latino youth having lower scores on several SES indicators than Caucasian youth. Interestingly, however, ethnicity did moderate the associations between economic stress and both depressive symptoms and adherence. Economic stress was associated with poorer adherence and higher depressive symptoms among Caucasian youth, but these associations were weaker or non-existent among Latino youth. These findings are consistent with research on the Latino paradox which suggests that Latino samples are less likely to experience adverse health outcomes despite their heightened socioeconomic risk (Franzini, Ribble, & Keddie, 2001; Ruiz, Steffen, & Smith, 2013).

I hypothesized that Latino youth would experience heightened levels of stress across multiple domains of general life stress. I also had predicted that Latino youth would report heightened stress because I expected them to have lower average socioeconomic status, and

family income is considered one of the major contributing factors to economic stress and family stress (Drew et al., 2011; Parke et al., 2004). In this case, Latino youth did have significantly lower scores on reports of average income and mother education level, and indicators of lower SES themselves were associated with heightened reports of stress. Therefore, Latino youth had particular reason to report higher levels of stress. However, Latino and Caucasian youth in the sample for this study did not show significant differences in their report of stress across all stress dimensions.

One possibility for the lack of ethnic differences in stress may be that the measure of stress used in this study was too general in nature and did not capture the most salient sources of stress for the Latino sample, even though the general stress measure used was initially created to measure stress experienced by inner-city, multi-ethnic populations. For instance, this study did not directly measure acculturative stress, which can be described as the stress that immigrant families experience as they learn to assimilate into their new cultural environment (Lara et al., 2005). This variable may have been particularly important to include as it has been associated with poorer psychosocial adjustment (Hovey & King, 1996), and heightened participation in risk behaviors (e.g., smoking, drinking) and depressive symptoms (Romero, Martinez, & Carvajal, 2007)

Another potential reason why there were not significant differences found in reports of stress between Caucasian and Latino youth is that the Latinos in this sample were mostly second and third generation Latino youth. Therefore, they may already be more highly acculturated into mainstream Caucasian culture, allowing for increased acceptance and access into community resources. In addition, since the Latino youth in this sample may be more acculturated, they may

experience fewer barriers and stressors that can be associated with being less acculturated (e.g., language barrier). Another point of consideration is that Latino youth in Dallas may have different experiences of acculturation and stress than would Latino youth living in a less diverse community. For example, Latino youth in Dallas may experience less school hassles and peer hassles because they may not be as visible of a minority than Latino youth living in cities that are predominantly Caucasian. The absence of an association between levels of acculturation and different types of stress is consistent with these possibilities. Identifying whether Latino experiences of acculturation have a significant effect on the experience of stress, diabetes health outcomes, and psychosocial adjustment should be considered more closely in future research of stress in Latino youth with type 1 diabetes.

The association between acculturation and health is complex and inconsistent. In a major review of literature on the effect of acculturation on Latino health outcomes and behaviors, Lara et al. (2005) reported mixed results, with some studies suggesting being more acculturated was associated with poorer health outcomes for Latinos, and others suggesting that being more acculturated was associated with increased utilization and access to healthcare (Lara et al., 2005). In the sample for this study, acculturation was not associated with diabetes outcomes or levels of stress reported by adolescents. All adolescents chose English as their preferred language and the majority of Latino adolescents were second or third generation immigrants. Future research should consider studying both first generation as well as later generation Latinos given the research on the link between acculturation and stress in these populations.

The present study contributes to the limited research examining associations between stress and adolescent diabetes health outcomes. Stress was associated with poorer diabetes

management and psychosocial adjustment for the entire sample. Specifically, results showed that each type of stress was associated with increased adolescent report of depressive symptoms across ethnic groups. This is consistent with past findings in the literature supporting the association of stressful events with poorer psychological well being (Alva & De los Reyes, 1999; Compas, Malcarne, & Fondacaro, 1988; Pinquart & Shen, 2011), and depressive symptoms in youth with type 1 diabetes (Hood et al., 2006). In addition, stress was associated with poorer metabolic control and poorer adherence, which is also commensurate with past research findings (Berlin, Rabideau, & Hains, 2012; Silverstein et al., 2005). The fact that practically all dimensions of stress were associated with indices of poor diabetes outcomes in this diverse sample provides compelling evidence of the importance of studying stress in youth with diabetes and potentially other chronic conditions.

I also examined whether there are ethnic differences in the associations of general stress with various diabetes management outcomes (i.e., adherence, metabolic control) and psychosocial adjustment (i.e., depressive symptoms). Adolescent reports of school hassles were associated with adolescent reports of depressive symptoms and poorer adherence when ethnicity was statistically controlled, and was equally associated with poor outcomes for both Caucasian and Latino youth. Family conflict was also associated with higher depressive symptoms and poorer metabolic control when ethnicity was statistically controlled, and was equally associated with poor outcomes for Caucasian and Latino youth, despite that maintaining family harmony and showing respect are two important values often upheld in Latino culture. Finally, peer hassles were associated with higher reports of depressive symptoms when ethnicity was statistically controlled, and was equally associated across Caucasian and Latino youth. These

links between stress and poorer diabetes management is consistent with the general literature. Type 1 diabetes management poses many challenges and can serve as a source of stress for youth with diabetes (Beveridge et al., 2005). Stressful life events and stress accompanying diabetes management have been associated with poorer metabolic control (Berlin, Rabideau, & Hains, 2012), poorer adherence (Silverstein et al., 2005), and heightened psychological distress (Hood et al., 2006) among adolescents with type 1 diabetes.

When focusing specifically on economic stress, however, ethnicity moderated the association between economic stress and adolescent reports of depression and of adherence. This moderation effect revealed that economic stress was associated with heightened depressive symptoms and poorer adherence for the Caucasian adolescents, but not for the Latino adolescents. Additional hierarchical regression analyses with covariates (i.e., age, pump status, and time since diagnosis) revealed that ethnicity still moderated the association between economic stress and adolescent report of adherence and depression, giving further credence to the roll that ethnicity plays in the relationship of economic stress with poorer adolescent outcomes.

This interaction pattern is consistent with the Latino paradox, a phenomenon in which Latino individuals show a tendency to maintain resilience (e.g., experience lower mortality rates) in the face of economic stressors when compared to Caucasian individuals (Franzini, Ribble, & Keddie, 2001; Ruiz, Steffen, & Smith, 2013). In the only study we are aware of examining this phenomenon in youth with type 1 diabetes, Wang et al. (2011) found that Latino ethnicity moderated associations between SES and trajectories of deterioration in metabolic control across adolescence. Specifically, Latino youth living in poorer neighborhoods showed slower rates of

deterioration in metabolic control across the adolescent years than Latino youth living in wealthier neighborhoods, while the reverse pattern was observed among their Caucasian counterparts (i.e., Caucasian youth living in poorer neighborhoods showed faster rates of deterioration, suggesting they were adversely affected by poorer SES). Discovering the potential resiliency factors in diverse populations that can explain these patterns may assist health care professionals in providing effective and culturally sensitive intervention treatments.

While it is not entirely clear why economic stress was the only type of stress in which Latino youth showed more resiliency than their Caucasian counterparts in terms of diabetes management outcomes, it is possible that cultural factors provide resources and protect adolescents against negative experiences related to economic stress. For example, economic stressors such as family financial problems or parent(s) losing a job may be considered as less stressful for Latinos if they uphold the Latino cultural value of familismo, where problems may feel less burdensome because other family members equally share the weight. Caucasian youth who may not share this family value to the same extent may feel more affected by the experience of economic stress, which is then reflected in poorer diabetes outcomes and/or psychosocial adjustment issues. However, familismo as a potential buffer may not apply to other types of stress, like peer hassles or school hassles, which may be perceived as having more of an effect on the individual family member rather than the family as a whole.

Although ethnicity moderated associations of economic stress with both adherence and depressive symptoms, it did not significantly moderate associations with HbA1c levels. One reason for this finding may be that HbA1c could be affected by broad factors, such as age, pump status, and time since diagnosis, which may have a more direct effect on metabolic control than

ethnicity. In fact, additional regression analyses did reveal that adolescent pump status and time since diagnosis had significant main effects on the relationship between metabolic control and stress, where being on an insulin pump and having a shorter time since diagnosis were associated with better metabolic control.

It is notable, however, that economic stress itself was associated with poorer metabolic control in general (i.e., as a main effect association), suggesting that economic stress can undermine metabolic control for both Caucasian and Latino youth. This is consistent with a large literature demonstrating poorer health outcomes associated with lower SES (Drew et al., 2011, Adler & Newman, 2002; Barrera et al., 2002; Prelow, Danoff-Burg, Swenson, & Pulgiano, 2004). Potentially the stress of living in an unstable economic environment, which is what the items on the economic stress measure tended to capture, has fairly direct metabolic consequences for both Caucasian and Latino youth.

Limitations of the study. Results should be considered in light of several limitations. The sample size for each ethnic group was relatively small, reducing power to detect small effects. There were also limitations with the measures in the study. Some of the outcome measures were self-report questionnaires. In addition, there may have been selection biases given that a relatively small number of adolescents who were eligible agreed to participate. The Latino group, although mostly 3rd generation English speaking Mexican Americans nevertheless included participants from other cultural contexts and cannot be presumed to be homogeneous. Therefore, future research to parse out how stress, diabetes management outcomes, and psychosocial adjustment are associated when examining Latino ethnic groups separately (e.g., Mexican-American, Cuban-American, Puerto Rican-American, etc.) may prove fruitful.

Implications and Conclusions. In general, there is a scarcity of research looking at stress and diabetes outcomes in ethnically diverse populations. This study aimed to explore potential differences between Caucasian and Latino youth in report of stress and how stress may affect diabetes outcomes and psychosocial adjustment. Latino youth appear resilient to adverse socioeconomic contexts, which supports the phenomenon of the Latino paradox. Therefore, this study helps contribute to the understanding of stress in a diverse sample of diabetic youth. Understanding resiliency factors in diverse populations may assist health care professionals in providing effective and culturally sensitive interventions treatments.

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Table 1

Descriptive Information for Overall Sample and Across Ethnic Groups

	Overall Sample N = 118 M (SD)	Latino N = 56 M (SD)	Caucasian N = 62 M (SD)
Age of adolescent	13.24 (1.69)	13.30 (1.78)	13.19 (1.63)
Gender of adolescent (% Female)	54.20%	37.50%	53.20%
Time since diagnosis (years)	4.62 (2.84)	4.31 (2.45)	4.90 (3.14)
% on insulin pump	25.40%	19.60%	30.60%
Census tract median family income	$61,700 ($26,197)	$50,493 ($18,512)**	$71,924 ($28,078)**
Household Income (mother report)	$25,000 - $49,999	$15,000 - $24,999	$50,000 - $74,999
% Married	76.10%	66.1%**	85.2%**
English is primary language at home (%)	72.60%		
Highest average level of mother education	Partial college (at least one year)	High school graduate (private, parochial, or public)*	Associate's/vocational degree*
Generational status of teen			
1st generation - adolescent and mother born outside U.S.		12% (N = 6)	
2nd generation - adolescent born in U.S., mother outside U.S.		57% (N = 28)	
3rd generation - adolescent and mother born in U.S.		31% (N = 15)	
Adolescent report of family conflict (MESA)	1.02 (1.36)	1.07 (1.41)	0.97 (1.32)
Adolescent report of peer hassles (MESA)	2.72 (2.49)	2.96 (2.27)	2.50 (2.68)
Adolescent report of school hassles (MESA)	1.37 (1.25)	1.45 (1.33)	1.29 (1.18)
Adolescent report of economic stress (MESA)	1.33 (1.74)	1.65 (1.96)$^{+}$	1.05 (1.49)$^{+}$
Adolescent report of depressive symptoms (CDI)	8.36 (6.09)	9.11 (6.83)	7.69 (5.32)
Adolescent report of adherence (SCI)	4.04 (0.68)	3.97 (0.78)	4.09 (0.57)
HbA1c	8.55 (1.55)	8.77 (1.67)	8.35 (1.43)

Note: * = $p < .05$, ** = $p < .001$, $^{+}$ = p = .06

Table 2

Correlation Matrix Between Stress and Demographic Variables with Diabetes Outcomes and Psychosocial Adjustment

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Gender	-	-0.012	-0.027	0.050	-0.205**	-0.248**	0.158	0.062	0.123	0.094	0.030	0.092	-0.191*	-0.153
2. Age (yrs)		-	0.092	0.072	-0.025	-0.028	0.035	-0.014	0.220*	0.078	0.005	0.153	-0.248**	0.199*
3. Time since diagnosis (yrs)			-	-0.299**	0.081	0.113	-0.104	0.061	0.220*	0.208*	0.177	0.123	0.038	0.226*
4. Pump status				-	-0.286**	-0.242*	0.126	0.152	0.052	0.016	0.023	0.095	-0.120	0.227*
5. Mother education level					-	0.499**	-0.570**	-0.184*	-0.058	-0.022	-0.216*	-0.043	0.096	-0.153
6. Family income						-	-0.411**	-0.075	-0.194*	-0.191*	-0.225*	-0.177	0.151	-0.220*
7. Ethnicity							-	0.039	0.093	0.066	0.174	0.117	-0.087	0.135
8. Family conflict								-	0.340**	0.331**	0.559**	0.315**	-0.179	0.241**
9. Peer hassles									-	0.487**	0.438**	0.323**	-0.194*	0.159
10. School hassles										-	0.339**	0.331**	-0.289**	0.122
11. Economic stress											-	0.205*	-0.219*	0.229*
12. Depression												-	-0.495**	0.195*
13. Adherence													-	-0.215*
14. HbA1c														-

Note: * = p < .05, ** = p < .001

For ethnicity, negative scores indicate Caucasian and positive scores indicate Latino

For gender, negative scores indicate females and positive scores indicate males

Table 3

Hierarchical Regression Analyses Testing Stress X Ethnicity Interactions Predicting Adolescent Depression

Predictor Variables	Unstandardized Coefficient B	SE	β
Family Conflict (MESA)			
Step 1 $\Delta R^2 = .110$, $F(2,114) = 7.053$**			
Family Conflict (MESA)	1.393	0.397	0.311**
Ethnicity	0.640	0.537	0.0105
Step 2 $\Delta R^2 = .005$, $F(3,113) = 0.622$			
Family Conflict (MESA)	1.396	0.397	0.311**
Ethnicity	0.641	0.538	0.105
Interaction	-0.313	0.397	-0.070
Peer Hassles (MESA)			
Step 1 $\Delta R^2 = .112$, $F(2,114) = 7.203$**			
Peer Hassles (MESA)	0.77	0.217	0.315**
Ethnicity	0.535	0.539	0.088
Step 2 $\Delta R^2 = .000$, $F(3,113) = 0.001$			
Peer Hassles (MESA)	0.771	0.223	0.316**
Ethnicity	0.535	0.541	0.088
Interaction	0.008	0.223	0.003
School Hassles (MESA)			
Step 1 $\Delta R^2 = .119$, $F(2,114) = 7.691$**			
School Hassles (MESA)	1.584	0.430	0.325**
Ethnicity	0.583	0.535	0.096
Step 2 $\Delta R^2 = .003$, $F(3,113) = 0.372$			
School Hassles (MESA)	1.600	0.432	0.328**
Ethnicity	0.583	0.537	0.096
Interaction	-0.263	0.432	-0.054
Economic Stress (MESA)			
Step 1 $\Delta R^2 = .049$, $F(2,114) = 2.927$			
Economic Stress (MESA)	0.665	0.324	0.190
Ethnicity	0.512	0.564	0.084
Step 2 $\Delta R^2 = .047$, $F(3,113) = 5.919$*			
Economic Stress (MESA)	0.831	0.325	0.238*
Ethnicity	0.476	0.552	0.078
Interaction	-0.791	0.325	-0.223*

Note: * = $p < .05$, ** = $p < .001$

Table 4

Hierarchical Regression Analyses Testing Stress X Ethnicity Interactions Predicting Adolescent Adherence

Predictor Variables	Unstandardized Coefficient B	SE	β
Family Conflict (MESA)			
Step 1 $\Delta R^2 = .039$, $F(2,113) = 2.271$			
Family Conflict (MESA)	-0.088	0.046	-0.176
Ethnicity	-0.056	0.062	-0.082
Step 2 $\Delta R^2 = .008$, $F(3,112) = 0.957$			
Family Conflict (MESA)	-0.088	0.046	-0.176
Ethnicity	-0.055	0.062	-0.081
Interaction	0.045	0.046	0.090
Peer Hassles (MESA)			
Step 1 $\Delta R^2 = .042$, $F(2,113) = 2.500$			
Peer Hassles (MESA)	-0.051	0.025	-0.187*
Ethnicity	-0.047	0.063	-0.069
Step 2 $\Delta R^2 = .000$, $F(3,112) = 0.011$			
Peer Hassles (MESA)	-0.051	0.026	-0.190*
Ethnicity	-0.047	0.063	-0.069
Interaction	-0.003	0.026	-0.010
School Hassles (MESA)			
Step 1 $\Delta R^2 = .089$, $F(2,113) = 5.501$*			
School Hassles (MESA)	-0.155	0.049	-0.285*
Ethnicity	-0.048	0.061	-0.071
Step 2 $\Delta R^2 = .001$, $F(3,112) = 0.135$			
School Hassles (MESA)	-0.156	0.049	-0.287*
Ethnicity	-0.048	0.061	-0.071
Interaction	0.018	0.049	0.033
Economic Stress (MESA)			
Step 1 $\Delta R^2 = .051$, $F(2,113) = 3.038$			
Economic Stress (MESA)	-0.086	0.038	-0.211*
Ethnicity	-0.037	0.063	-0.055
Step 2 $\Delta R^2 = .040$, $F(3,112) = 4.896$*			
Economic Stress (MESA)	-0.097	0.037	-0.239*
Ethnicity	-0.031	0.062	-0.046
Interaction	0.083	0.037	0.201*

Note: * = $p < .05$, ** = $p < .001$

Table 5

Hierarchical Regression Analyses Testing Stress X Ethnicity Interactions Predicting Adolescent Metabolic Control

Predictor Variables	Unstandardized Coefficient B	SE	β
Family Conflict (MESA)			
Step 1 $\Delta R^2 = .076$, $F(2,114) = 4.670$*			
Family Conflict (MESA)	0.270	0.103	0.236*
Ethnicity	0.207	0.140	0.133
Step 2 $\Delta R^2 = .007$, $F(3,113) = 0.841$			
Family Conflict (MESA)	0.269	0.103	0.235*
Ethnicity	0.207	0.14	0.133
Interaction	0.095	0.103	0.083
Peer Hassles (MESA)			
Step 1 $\Delta R^2 = .042$, $F(2,114) = 2.481$			
Peer Hassles (MESA)	0.092	0.057	0.147
Ethnicity	0.200	0.143	0.129
Step 2 $\Delta R^2 = .011$, $F(3,113) = 1.339$			
Peer Hassles (MESA)	0.107	0.059	0.171
Ethnicity	0.196	0.143	0.126
Interaction	0.068	0.059	0.109
School Hassles (MESA)			
Step 1 $\Delta R^2 = .033$, $F(2,114) = 1.942$			
School Hassles (MESA)	0.141	0.115	0.113
Ethnicity	0.210	0.143	0.135
Step 2 $\Delta R^2 = .011$, $F(3,113) = 1.327$			
School Hassles (MESA)	0.149	0.115	0.119
Ethnicity	0.21	0.143	0.135
Interaction	-0.133	0.115	-0.106
Economic Stress (MESA)			
Step 1 $\Delta R^2 = .063$, $F(2,114) = 3.844$*			
Economic Stress (MESA)	0.188	0.082	0.210*
Ethnicity	0.164	0.143	0.106
Step 2 $\Delta R^2 = .009$, $F(3,113) = 1.054$			
Economic Stress (MESA)	0.206	0.084	0.231*
Ethnicity	0.160	0.143	0.103
Interaction	-0.086	0.084	-0.095

Note: * = $p < .05$, ** = $p < .001$

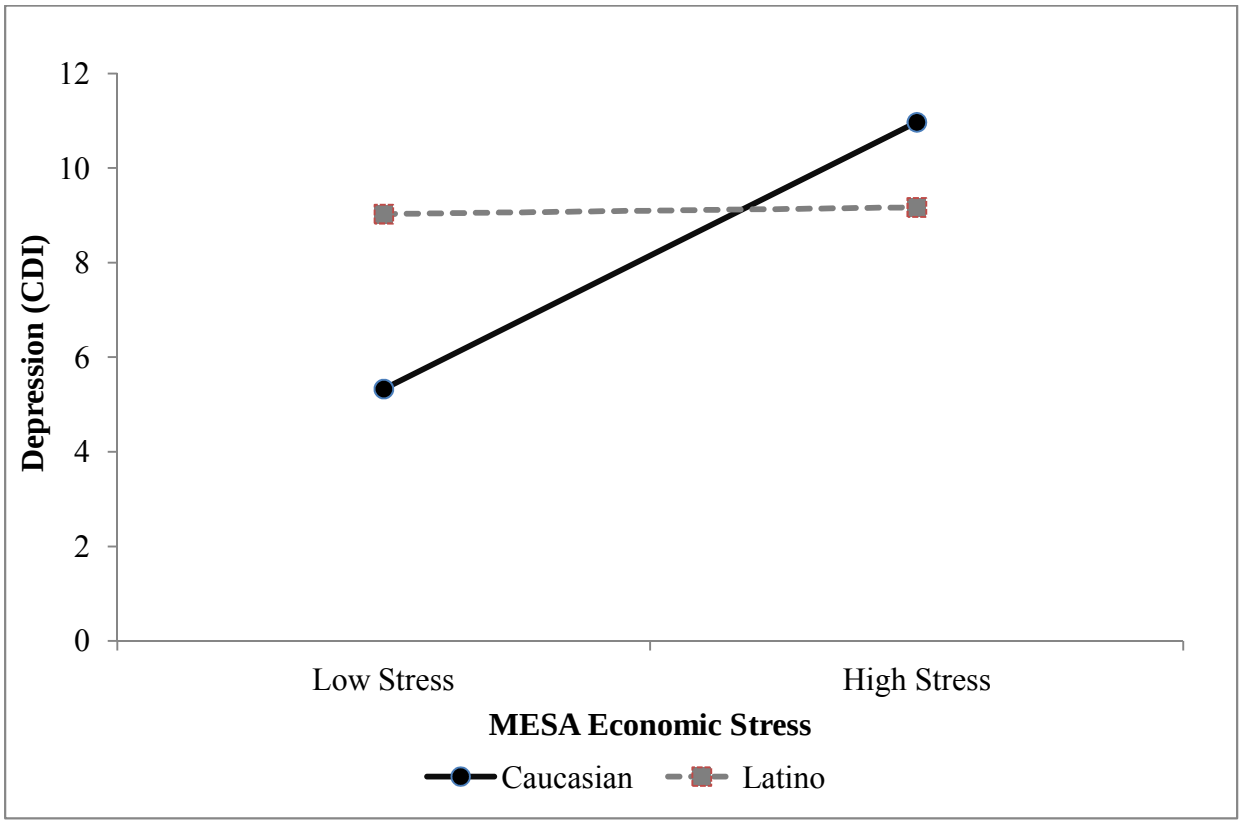

Figure 1. Association between economic stress and adolescent depressive symptoms moderated by ethnicity.

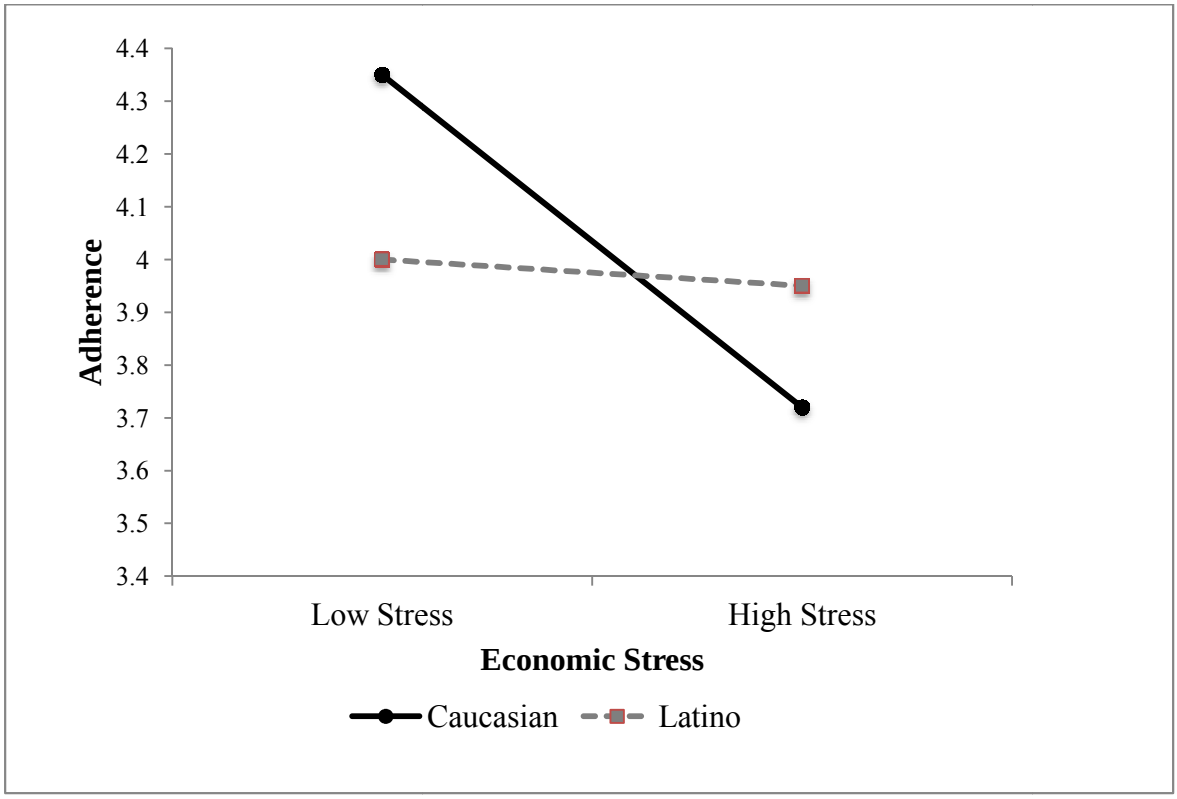

Figure 2. Association between economic stress and adherence moderated by ethnicity.

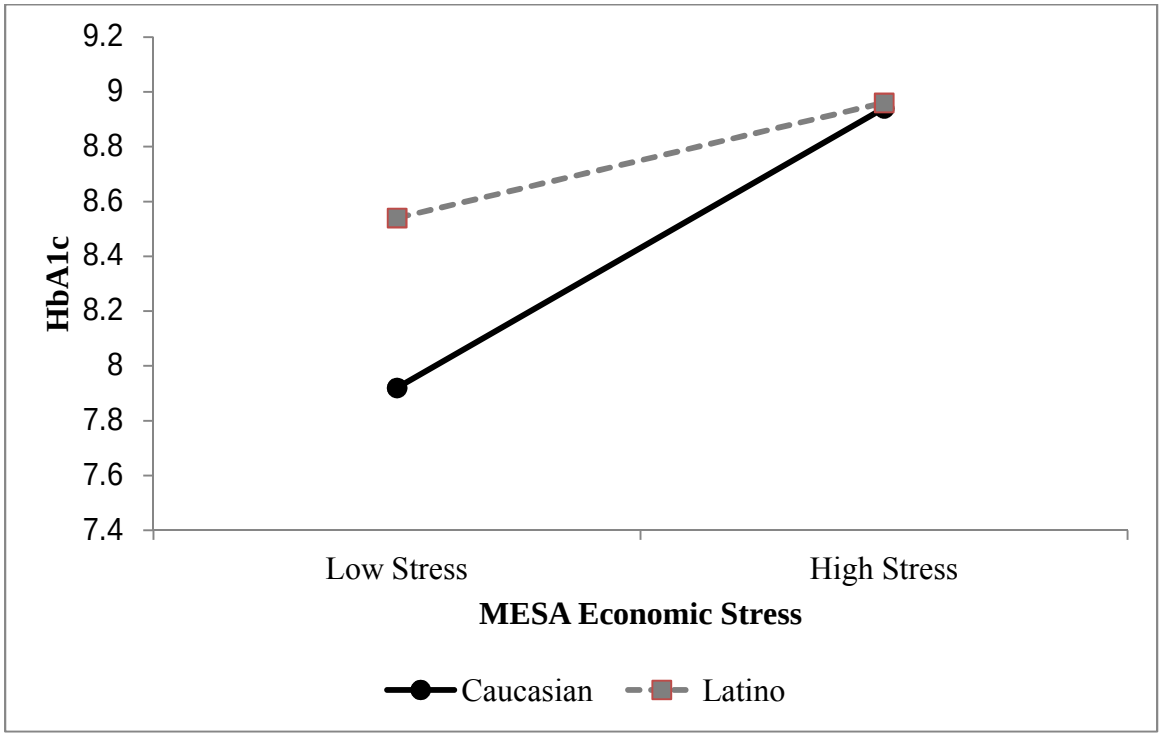

Figure 3. Association between economic stress and metabolic control moderated by ethnicity.

Appendix A

Multicultural Events Scale for Adolescents – Adolescent Report of Stressful Events

Instructions: Here are some events that sometimes happen to teenagers. Please indicate whether each of the following events have happened to you in the past 3 months.

	Happened	Did Not Happen
You broke up with your boyfriend/girlfriend	1	2
Your parent lost a job	1	2
You changed schools	1	2
A close friend died	1	2
You were pressured to do drugs, smoke, or drink alcohol	1	2
You were pressured against your will to join a gang	1	2
Your parent(s) got upset at you for not participating in the family's cultural or religious traditions	1	2
You did poorly on an exam or school assignment	1	2
Your parent was upset because he or she could not find work	1	2
You had to wear clothes that were dirty, worn out, or don't fit	1	2
Your close friend(s) got drunk or high	1	2
Your parent(s) talked about having serious money problems	1	2
Your family had to stay in a homeless shelter or public place	1	2
Your friends criticized you for hanging out with other ethnic or racial groups	1	2
Other kids made fun of the way you look	1	2
A friend that you trusted did not keep a secret	1	2
You had a major failure in sports or an extracurricular activity	1	2
You were not chosen for a team or activity that you wanted to join	1	2
Your parent(s) criticized you for hanging out with people of a different race or culture	1	2
Your boyfriend/girlfriend dumped you or cheated on you	1	2
Things in your home did not work the way they should (no water, no electricity, things fell apart, etc.)	1	2
You liked someone who didn't like you	1	2
You had a serious disagreement with your mom's boyfriend or your dad's girlfriend	1	2
Other members of your family (or people you live with) had a serious disagreement or fight	1	2
You had a disagreement with a teacher or principal	1	2
Other kids wanted to fight with you or tried to fight with you	1	2
Members of your family hit or hurt each other	1	2

A close friend had a serious emotional problem	1	2
A teacher or principal criticized you or tried to embarrass you in from of other students	1	2
Members of your family refused to speak to each other	1	2
You had to work to support other family members	1	2
Your parents had a serious disagreement or fight with each other	1	2
You mom/dad had a serious disagreement or fight with a boyfriend/girlfriend	1	2
Family members could not go someplace they needed to go (work, school, doctor, etc.) because they had no transportation	1	2
You had to go without a meal because your family did not have enough money	1	2
You had to do almost all the cooking, cleaning, or childcare in your home because your parent(s) had to work	1	2
People in your family accused you of not being proud of your culture or race	1	2
You had a disagreement or fight with a close friend	1	2

Appendix B

Children's Depression Inventory – Child Report of Depressive Symptoms

Kids sometimes have different feelings and ideas.

This form lists the feelings and ideas in groups. From each group of three sentences, pick one sentence that describes you ***best*** for the past two weeks. After you pick a sentence from the first group, go on to the next group.

There is no right answer or wrong answer. Just pick the sentence that best describes the way you have been recently. Put a mark like this ☒ next to your answer. Put the mark in the box next to the sentence that you pick.

Here is an example of how this form works. If you read books a lot, you would probably check the first sentence, like this.

Example:

☒	I read books all the time.
☐	I read books once in a while.
☐	I never read books.

Remember, in each box, pick out the one sentence that describes you best in the PAST TWO WEEKS.

Item 1 □ I am sad once in a while. □ I am sad many times. □ I am sad all the time	**Item 8** □ All bad things are my fault. □ Many bad things are my fault. □ Bad things are not usually my fault.
Item 2 □ Nothing will ever work out for me. □ I am not sure if things will work out for me. □ Things will work out for me O.K.	**Item 9** □ I do not think about killing myself. □ I think about killing myself but I would not do it. □ I want to kill myself.
Item 3 □ I do most things O.K. □ I do many things wrong. □ I do everything wrong.	**Item 10** □ I feel like crying every day. □ I feel like crying many days. □ I feel like crying once in a while.
Item 4 □ I have fun in many things. □ I have fun in some things. □ Nothing is fun at all.	**Item 11** □ Things bother me all the time. □ Things bother me many times. □ Things bother me once in a while.
Item 5 □ I am bad all the time. □ I am bad many times. □ I am bad once in a while	**Item 12** □ I like being with people. □ I do not like being with people many times. □ I do not want to be with people at all.
Item 6 □ I think about bad things happening to me once in a while. □ I worry that bad things will happen to me. □ I am sure that terrible things will happen to me.	**Item 14** □ I look O.K. □ There are some bad things about my looks. □ I look ugly.
Item 7 □ I hate myself. □ I do not like myself. □ I like myself.	**Item 15** □ I have to push myself all the time to do my schoolwork. □ I have to push myself many times to do schoolwork. □ Doing schoolwork is not a big problem.

Item 16
- ☐ I have trouble sleeping every night.
- ☐ I have trouble sleeping many nights.
- ☐ I sleep pretty well.

Item 17
- ☐ I am tired once in a while.
- ☐ I am tired many days.
- ☐ I am tired all the time.

Item 18
- ☐ Most days I do not feel like eating.
- ☐ Many days I do not feel like eating.
- ☐ I eat pretty well.

Item 19
- ☐ I do not worry about aches and pains.
- ☐ I worry about aches and pains many times.
- ☐ I worry about aches and pains all the time.

Item 20
- ☐ I do not feel alone.
- ☐ I feel alone many times.
- ☐ I feel alone all the time.

Item 21
- ☐ I never have fun at school.
- ☐ I have fun at school only once in a while.
- ☐ I have fun at school many times.

Item 22
- ☐ I have plenty of friends.
- ☐ I have some friends but I wish I had more.
- ☐ I do not have any friends.

Item 23
- ☐ My schoolwork is alright
- ☐ My schoolwork is not as good as before.
- ☐ I do very badly in subjects I used to be good in.

Item 24
- ☐ I can never be as good as other kids.
- ☐ I can be as good as other kids if I want to.
- ☐ I am just as good as other kids.

Item 25
- ☐ Nobody really loves me.
- ☐ I am not sure if anybody loves me.
- ☐ I am sure that somebody loves me.

Item 26
- ☐ I usually do what I am told
- ☐ I do not do what I am told most of the time
- ☐ I never do what I am told

Item 27
- ☐ I get along with people
- ☐ I get into many fights
- ☐ I get into fights all the time.

Appendix C

Self Care Inventory – Child Report of Adherence to Diabetes Management

Self Care Inventory Child Report (SCI-C)

Instructions: Please rate each of the items according to how well you followed your recommended regimen for diabetes care in the past month. Use the following scale:

1 = Never did it

2 = Sometimes followed recommendations; mostly not

3 = Followed recommendations about 50% of the time

4 = Usually did this as recommended; occasional lapses

5 = Always did this as recommended without fail

NA = Not applicable to my regimen

In the past month, how well have you followed recommendations for:		**Never**	**Sometimes**	**50%**	**Usually**	**Always**	**NA**
1.	**Checking blood glucose with monitor?**	**1**	**2**	**3**	**4**	**5**	**NA**
2.	**Glucose recording?**	**1**	**2**	**3**	**4**	**5**	**NA**
3.	**Checking ketones in blood or urine when blood glucose level is high?**	**1**	**2**	**3**	**4**	**5**	**NA**
4.	**Administering correct insulin dose?**	**1**	**2**	**3**	**4**	**5**	**NA**
5.	**Administering insulin at right time?**	**1**	**2**	**3**	**4**	**5**	**NA**
6.	**Adjusting insulin intake based on blood glucose values?**	**1**	**2**	**3**	**4**	**5**	**NA**
7.	**Eating the proper foods or counting all carbohydrates eaten?**	**1**	**2**	**3**	**4**	**5**	**NA**
8.	**Eating meals/snacks on time?**	**1**	**2**	**3**	**4**	**5**	**NA**
9.	**Carrying quick-acting sugar to treat reactions?**	**1**	**2**	**3**	**4**	**5**	**NA**

10.	**Coming in for appointments?**	**1**	**2**	**3**	**4**	**5**	**NA**
11.	**Wearing a medic alert ID?**	**1**	**2**	**3**	**4**	**5**	**NA**
12.	**Exercising regularly?**	**1**	**2**	**3**	**4**	**5**	**NA**
13.	**Reading food labels?**	**1**	**2**	**3**	**4**	**5**	**NA**
14.	**Treating low blood glucose?**	**1**	**2**	**3**	**4**	**5**	**NA**
15.	**Counting carbohydrates correctly?**	**1**	**2**	**3**	**4**	**5**	**NA**
16.	**Calculating insulin doses based on carbohydrate content of meals or snacks?**	**1**	**2**	**3**	**4**	**5**	**NA**

BIOGRAPHICAL SKETCH

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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Austin College	B.A.	2011	Psychology
The University of Texas Southwestern Medical Center - School of Health Professions	M.R.C.	2013	Rehabilitation Counseling Psychology

Positions and Employment

2013 – present Texas Neurology, Psychometrist

Clinical Experience

2013 – 2013 UT Southwestern Neuropsychology, Graduate Student Intern

2012 – 2013 UT Southwestern School of Health Professions – Supported Employment, Graduate Student Intern

Presentations and Publications

2011 Southwestern Psychological Association, Undergraduate Student Poster Presentation

2013 National Conference in Pediatric Psychology, Graduate Student Poster Presentation (Granted Poster Award for Diversity)

Professional Memberships

2009 Psi Chi – National Psychology Honor Society