POSSIBLE MODERATORS OF THE RELATIONSHIPS BETWEEN HEALTH BELIEFS AND ADHERENCE AND METABOLIC CONTROL IN ADOLESCENTS WITH TYPE 1 DIABETES

By

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Abstract

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The Health Belief Model (HBM), as proposed by Janz & Becker (1984), is a theory of adherence to medical recommendation. Findings on the association between the HBM and adherence and metabolic control in adolescents with Type 1 diabetes have been inconsistent (e.g. Brownlee-Duffeck et al., 1987; Patino et al., 2005). The current study aimed to investigate the relationship between parent and adolescent health beliefs and adherence/metabolic control. Further, the study aimed to identify variables that may moderate the parent/adolescent health belief and adherence/metabolic control relationship; namely, amount of parent responsibility for diabetes care, parent emotional support, and executive functioning of parent/adolescent. Findings were generally unsupportive of HBM and moderation hypotheses but patterns emerged that may be important in future research and clinical work with this population. These themes include the tendency for Caucasians and younger adolescents to have better metabolic control, and the importance of parent perception of severity and susceptibility of diabetes complications and the significant correlation both parent and adolescent executive functioning abilities have with adherence/metabolic control. Clinically, results speak to the need of further assessment and intervention targeting health beliefs and executive functioning in parents of adolescents with type 1 diabetes. Results further indicate the need for additional and more nuanced research on health beliefs in this population.

Introduction

Type 1 diabetes is an endocrine disorder in which insulin is not produced due to pancreatic failure. Type 1 diabetes is typically diagnosed in early or middle childhood. The rate of Type 1 diabetes is estimated to be 1.6 per 1,000 school-age children, making it among the most common childhood chronic illnesses (Plotnick, 1999). There is no cure for diabetes but there are successful treatments. These treatments are complex and can require frequent monitoring of blood glucose levels, multiple daily insulin injections, strict diet, and consistent exercise (Hoffman, 2002). Adherence to medical regimen in type 1 diabetes is important for maintaining both short-term and long-term health. The short-term consequences of noncompliance include hyperglycemia (abnormally high blood sugar) and hypoglycemia (abnormally low blood sugar) both of which can lead to hospitalization and even death (Farrell, Cullen, & Carr, 2013). The long-term consequences of poor adherence in children with Type 1 diabetes include heart disease, peripheral vascular disease, neuropathy, retinopathy, renal disease and infection (Hoffman, 2002).

As children with Type 1 diabetes reach adolescence the rate of poor adherence increases and is estimated to be 30 to 60% of those diagnosed (Hoffman, 2002). Adolescence is a stage of development that is characterized by rapid physical, psychosocial, and cognitive changes. Adolescence is also a time period in which adolescents start becoming more independent and shift away from reliance on their parents (Steinberg & Morris, 2001). These natural correlates of adolescence make this time tumultuous for families with healthy children but make it even more problematic and complex for families with adolescents diagnosed with type 1 diabetes (Jessor, 1993).

Adolescents are typically becoming more autonomous in their everyday life and this desire for autonomy generally extends to wanting more responsibility for disease management (White, Miller, Smith, & McMahon, 2009). This can be problematic because the shift from parent responsibility to adolescent-only responsibility needs to be done with care and at a pace that is realistic for the individual adolescent (White et al., 2009). Other environmental and psychosocial factors are also related to the high rates of poor adherence in adolescents. Better adherence is related to higher socioeconomic status (Naar-King et al., 2006), increased family cohesion and family involvement (White, Miller, Smith, & McMahon, 2009), increased social support (Ellis et al., 2007) and absence of elevated anxiety and depression (LaGreca, Swales, Klemp, Madigan, & Skylar, 1995; White et al., 2009). Adherence or metabolic control among these studies is measured in various ways; typically, by patient or parent report of adherence to their prescribed medical regimen (i.e. how often they check their blood sugar, how often they give their insulin, how often they count carbohydrates) or by the patient's HbA1c, which is a medical test that gives providers a quantitative indication of how stable the adolescent's blood sugar has been over the last 8-12 weeks. Compounded with psychological factors such as depression, anxiety, and family cohesion, there are physiological factors associated with puberty that increase insulin resistance making glycemic control more difficult (Amiel et al., 1986). Understanding the factors related to low adherence in adolescents is important not only because of immediate health risks but also because health behaviors that emerge during adolescence often maintain over time (Bryden et al., 2001; Kovacs, Goldston, Orosky, & Iyenger, 1992).

The Health Belief Model

The Health Belief Model (HBM), as proposed by Janz & Becker (1984), is a theory of adherence to medical recommendation. The theory posits that health behaviors depend heavily on an individual's cognitions about the health behaviors recommended to a patient by their medical provider. This rationale stems from the concept that cognitions drive feelings and behaviors, a central tenant of Cognitive Behavioral Therapy (CBT). The HBM assumes that the value an individual assigns to a particular health goal and that individual's estimate of the likelihood that a certain behavior will achieve that goal predict the likelihood of the individual engaging in that health behavior. Based on the HBM, an individual's health behaviors will rely on five personal beliefs: beliefs about their personal susceptibility to illness, beliefs about the severity of illness, beliefs about the benefits of health behaviors/adherence, beliefs about barriers to adherence, and beliefs about internal as well as external stimuli that cue adherence (See Figure 1; Janz & Becker, 1984). The HBM was originally applied to preventative health actions (e.g. vaccination, doctor visits; Reiter, Brewer, Gottlieb, McRee, & Smith, 2009) but has since been applied to various medical regimen behaviors including adherence behaviors for adults with diabetes (e.g. Gherman et al., 2011; Nam, Chesla, Stotts, Kroon & Janson, 2011).

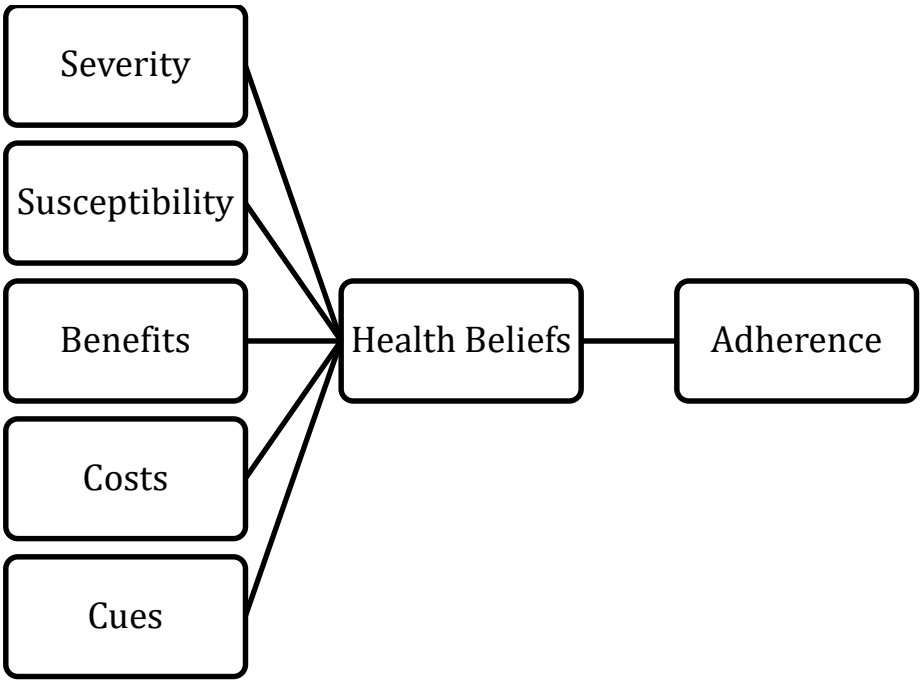


Figure 1. Illustration of the original HBM described by Janz &Becker (1984).

The HBM has also been applied to child healthcare. Many of these childhood studies have investigated the use of the HBM in predicting preventative care, medication adherence, and appointment attendance in healthy children and children with acute illnesses (e.g. Bush & Iannotti, 1990; Laraque et al., 1997); fewer studies have used the HBM to predict adherence in pediatric chronic illness populations (i.e. diabetes, chronic pain, asthma; Conn et al., 2005; McQuaid, Kopel, Klein, & Fritz, 2003). Of the eleven HBM and pediatric chronic illness studies, six have shown a relationship between the HBM and adherence. These six studies included the following samples: adolescent diabetes (Bond Aiken, & Somerville, 1992; Brownlee-Duffeck et al., 1987), young children with diabetes (Charron - Prochownik, Becker, Brown & Bennett, 1993), pediatric asthma (McQuaid, Kopel, Klein, & Fritz, 2003), and pediatric chronic pain (Vowles, Cohen, McCracken, & Esscleston, 2010). Two of the HBM studies, one using a

sample of various pediatric chronic illness groups and one using a pediatric diabetes sample, did not find a relationship between HBM and adherence (Clark et al., 1988; Patino, Sanchez, Edison, & Delamater, 2005). Some of the studies that support the HBM document a relationship between the entire HBM model and pediatric adherence to medical regimen while others show a relationship between adherence and specific beliefs in the HBM (Goldbeck & Bundschuh, 2007; McQuaid, Kopel, Klein, & Fritz, 2003; Vowles, Cohen, McCracken, & Esscleston, 2010). The specific beliefs that accounted for the most variance in adherence to medical regimen were beliefs about the severity of the illness and beliefs about the cost of adherence (Bond, Aiken, & Somerville, 1992; Brownlee-Duffeck et al., 1987). Together these HBM studies in pediatric chronic illness, including pediatric diabetes, chronic pain, and asthma samples, support the potential applicability of the HBM in the pediatric chronic illness population.

Three of the studies connecting the HBM to adherence in pediatric chronic illness have been in the type 1 diabetes population. In the first of these studies, health beliefs were measured by self-report using the Diabetes Health Belief Questionnaire (DHBQ; Brownlee-Duffeck, 1987). In the sample of adolescents and adults (13-64 years old; Brownlee-Duffeck, 1987) the original HBM (a composite including all five health beliefs in the model) was related to self-report of adherence. When looking exclusively at the adolescent/young adult sample (13-26 years; M = 18 years) in this study the HBM accounted for 52% of the variance in self-reported adherence. Further, beliefs about the costs or inconvenience of adherence were most strongly related to self-reported adherence while beliefs about the chances of developing a diabetes complication and beliefs about the severity of these complications were most strongly related to metabolic

control as measured by HbA1c which reflects an individual's average level of blood glucose control over the prior 6 to 12 weeks with higher numbers reflecting poorer control.

The HBM was also investigated by Bond, Aiken, & Somerville (1992) in a sample of children with a mean age of 14. This study used a combination of items from various measures including the DHBQ to measure self-reported health beliefs. Contrary to the results of Brownlee-Duffeck et al. (1987), there was no relationship between the entire HBM and self-reported adherence. However, they found an interaction effect between a composite of perceived severity and susceptibility (referred to as Threat Perception) and cues to adherence. When examining the interaction, results indicated that children who scored lower on Threat Perception and scored higher on Cues for Adherence were most likely to have HbA1c levels in the recommended range. This suggests that cues for adherence positively impacted metabolic control if threat perception was high but had a negative effect if perception of threat was low. Therefore, perceived threat may have a positive impact on adherence to medical regimen when the adolescent sees more cues to adherence but may have a negative impact on adherence when the adolescent dues not perceive these cues (Bond, Aiken, & Somerville, 1992). These results are not consistent with Brownlee-Duffeck (1987), however, there were a number of measurement differences. Brownlee- Duffeck (1987) used the DHBQ alone as a measure of health beliefs while Bond, Aiken, & Somerville (1992) measured the same constructs (costs of adherence, benefits of adherence, severity of disease, susceptibility to complications, and cues for adherence) they used a measure derived from a number of different measures (Diabetes Health Belief Questionnaire (Browlee-Duffeck, 1987);

Diabetes Health Belief Scale (Harris & Linn, 1985); Barriers to Adherence Questionnaire (Glasgow et al., 1986)). Further the composite used for cues of adherence in Bond, Aiken, & Somerville (1992) had a low alpha coefficient meaning any results, including the interaction findings, using the composite should be interpreted with caution.

The most recent investigation of the HBM in children/adolescents with type 1 diabetes found no relationship between the HBM and adherence or metabolic control in adolescents (11-16 years; Patino et al., 2005). Unlike the previous two studies, there were also no statistically significant relationships between components of the HBM and adherence/metabolic control found. The results of this study may have been disparate from the two previous studies because of demographic differences between the samples. The sample in Patino et al. (2005) included a much larger number of minority adolescents than previous studies (100% vs. 9% and 2%). The possibility of sample demographics explaining variations in results is supported by previous research in adult samples indicating that African American and Hispanic individuals perceived susceptibility to illness/ illness complications to be much higher (Steers, Elliot, Nemiro, Ditman & Oskamp, 1996). It may be that these tendencies, or other yet to be identified tendencies, affect the applicability of the HBM or the DHBQ in particular to non-Caucasian samples; however, more research is necessary to confirm this possibility.

Taken together these three studies of the HBM in type 1 diabetes offer some evidence that the HBM is applicable to adolescents with type 1 diabetes. However, a few study limitations deserve consideration. Two of the three studies added variables to the original model (e.g. self efficacy) which limit conclusions about the original HBM and may contribute to the variations in findings because each study was not investigating

precisely the same independent variables. All three studies used child/adolescent self-report of health beliefs. However, research in other populations (e.g. preventative care, pediatric asthma) has suggested that parent health beliefs can also be related to child adherence to medical recommendation (Goldbeck & Bundschuh, 2007; McQuaid, Kopel, Klein, & Fritz, 2003). Investigating parent health beliefs may be particularly relevant in type 1 diabetes because parental involvement in diabetes management is often encouraged by health professionals due to evidence of better health outcomes in adolescents with parents that stay involved in diabetes care (Goldbeck & Bundschuh, 2007). The importance of looking at beliefs held by both adolescents and parents involved in disease management is further supported by findings that parents and children do not always have similar health beliefs (Goldbeck & Bundschuh, 2007; Upton, Lawford, & Eiser, 2008; Vowles, Cohen, McCracken, & Esscleston, 2010). These discrepancies mean that assessing only one person's point of view is insufficient if both adolescent and parent beliefs influence overall adherence. In the current study both parent and adolescent health beliefs are represented within the model. In the current study the "cues for adherence" component of the original HBM is excluded from the model. This component was discarded because research has not consistently supported the internal consistency or validity of this HBM component (Patino et al., 2005).

In addition to these alterations the current models propose three variables that likely influence the relationship between parent/adolescent health beliefs and adherence by limiting efficacious implementation of health behaviors despite appropriate diabetes-related cognitions. In the context of type 1 diabetes, one of the current models includes how much responsibility a parent has for diabetes care, another includes amount of

parental emotional support for diabetes care, another parent/adolescent executive functioning abilities, and lastly parent/adolescent depressive symptoms as moderators in the HBM and adherence relationship. These variables were chosen for a variety of reasons. First, degree of responsibility taken by the parent is imperative to the model because the influence of each person's beliefs is likely contingent on how active each individual is in disease management on a daily basis. Second, the amount of emotional support for diabetes management an adolescent perceives from their parents has been shown to impact adolescent diabetes care self-efficacy and adolescent adherence (e.g. Skinner, Hampson, & Fife-Schaw, 2002) and it is likely that disruptions in family relationships will impact the way parent/adolescent health beliefs relate to adherence. Third, parent/adolescent executive functioning is included in the model because the complex demands of diabetes management require well-developed executive functioning abilities (e.g. McNally, Rohan, Pendley, Delamater, & Drotar, 2010). Deficits in executive functioning will remain problematic regardless of someone's thoughts or motivations because these abilities are distinct from cognitions (Taylor et al., 2004). Fourth, parent/adolescent depressive symptoms are known to influence adolescent adherence and HbA1c in adolescents with type 1 diabetes (e.g. LaGreca, Swales, Klemp, Madigan, & Skyler, 1995). Depression can have large effects on motivation and memory for details which could disrupt the relationship between an individual's motivation and cognitions at a specific time and their adherence behaviors over the long term (e.g. Korbel, Wiee, Berg, & Palmer, 2007).

Responsibility Sharing. Due to family variation in the amount of responsibility an adolescent has for their disease management, how management responsibilities are

divided between parent(s) and adolescent is an important consideration when seeking a better understanding of the parent/adolescent health beliefs and adherence/metabolic control relationships. During adolescence the need to transfer diabetes care from parent to adolescent becomes inevitable, both because the adolescent will soon be an adult and have to resume complete responsibility for care and because adolescents spend increasing less time with their parents. It is hypothesized that this transition of responsibility could partially explain the drop in adherence that occurs in adolescents (Palmer et al., 2004). Research has demonstrated that decreasing parental involvement in diabetes tasks often occurs prematurely, occurring alongside the increase of non-health related responsibilities and growing autonomy (Anderson, Auslander, Jung, Miller, & Santiago, 1990). Developmental psychologists theorize that increases in everyday adolescent autonomy are often triggered by signs of pubertal change (Steinberg; 1987). While such triggers may be appropriate for non-healthcare related increases in autonomy, it has been shown that pubertal status and age are not sufficient markers that an adolescent is capable of increased diabetes management responsibility (Vesco et al., 2010). While it is estimated that most adolescents can participate in the majority of diabetes tasks by age 13, continued parental involvement has been shown to be related with better adherence and HbA1c during adolescence (Helgeson et al., 2008; Vesco et al., 2010). Further, rapid or premature decreases in parental involvement are related to increased numbers of diabetes-related hospital stays and higher HbA1c (Anderson, Ho, Bracket, Laffel, 1999; Wysocki et al., 1996).

Research suggests that autonomy and social-emotional maturity are better indictors of adolescent readiness for increased responsibility in diabetes management

than either age or pubertal status (Palmer et al., 2004). Adolescents with high dependency on others and little parental involvement in diabetes care are more likely to have poor adherence and metabolic control (Palmer et al., 2004). Based on the adolescent diabetes literature, health professionals have come to encourage the continued involvement of parents well into late adolescence and interventions focused on maintaining parent involvement have been shown to minimize diabetes-related hospitalizations and spikes in HbA1c (Anderson, Ho, Bracket, Laffel, 1999; Helgeson et al., 2008).

Despite these recommendations, the degree of parental involvement in adolescent diabetes care varies greatly by family (Helgeson et al., 2008). Given this variation the influence of an adolescent or parent's particular behaviors or beliefs will also vary widely by family. Therefore, while both parent and adolescent health beliefs are likely related to adherence and metabolic control, the nuances of this relationship likely vary by amount of parent responsibility for management. For instance, if a parent takes the majority of the responsibility for diabetes management, their beliefs are likely more strongly related to adherence/metabolic control than if the adolescent takes the majority of the responsibility. The varying influence of a parent or adolescent's beliefs on adherence and metabolic control depending on amount of parent responsibility could explain some of the inconsistent results of previous HBM research in this area as parent responsibility has not been examined as a moderator. Understanding how responsibility-sharing impacts the relationship between cognition and adherence may be helpful in identifying efficient intervention targets tailored to individual families.

Parental Emotional Support. While more parental involvement in disease care of adolescents with type 1 diabetes is associated with better health outcome, the strain of

maintaining a balance of adolescent and parent responsibility of medical regimen responsibilities can increase family conflict and negative interactions between parents and adolescents (Anderson, Ho, Brackett, Finkelstein, & Laffel, 1997). The tendency toward family discord in families with adolescents diagnosed with type 1 diabetes is supported by research that adolescents with type 1 diabetes describe their families as less cohesive and emotionally expressive than healthy adolescents (Seiffge-Krenke, 1998; Overstreet et al., 1995).

There is overwhelming support for the negative relationship between family conflict (diabetes and non-diabetes related)/ general negative family environments (i.e. low cohesion, poor communication) and adolescent well-being/ quality of life (e.g. Dashiff, Hardman, & McClaim, 2008, Wysocki, 1993). However, there is only inconsistent support for the relationship between these general measures of family conflict/ negative family environment and adherence/metabolic control (See Dashiff, Hardman, & McClaim., 2008). The more specific family discord variable of adolescent perception of parental warmth and caring specifically related to diabetes has been proposed to be more strongly related to adherence/metabolic control (Lewin et al., 2006). The reason for this could be that when examining disease outcome, it is how parents and adolescents interact around diabetes specifically that is important not how they interact more broadly. Further, there is evidence that parent-child interaction around diabetes is not always representative of parent-child interaction around other topics (Lewin et al., 2006). This has been supported by studies finding that adolescent perception of low parental warmth/caring in regards to diabetes is related to both poor adherence and metabolic control (Lewin et al., 2006; McKelvey, 1993; Wysocki et al., 1996). The

importance of parental emotional support (i.e. parent warmth/caring) in adolescent adherence has been further demonstrated by findings that parental involvement with diabetes care (which has typically been considered an important predictor of adolescent adherence) was only related to adherence/metabolic control when the adolescent endorsed parental emotional support and warmth related to diabetes management (Jaser, Whittemore, Ambrosino, Lindemann, & Grey, 2008).

Lewin et al. (2006) proposed that disease-specific parental emotional support is particularly important for adolescents with type 1 diabetes because the relationship between critical parenting and adolescent compliance is bidirectional meaning parents and adolescents become stuck in a coercive cycle (Shaw & Bell, 1993) that negatively influences diseases management. An adolescent's failure to adhere to medical regimen may elicit parent criticism (i.e. a lack of emotional support), which in turn can lead to more parent-adolescent conflict around diabetes management, starting the cycle over. As the cycle continues over time, the parent's negativity increases and the adolescent's noncompliance in regards to disease management increases. This theory is supported by findings that perceived parent emotional support relates to diabetes management in adolescents but not in younger children (Lewin et al., 2006).

In the same way that parental involvement is only related to adolescent adherence in the context of an emotional supportive family, parent and adolescent diabetes health beliefs may only be related to adolescent adherence in the context of a supportive family environment because the conflict caused by this lack of emotional support is likely to interfere with a parent and/or adolescent's ability to efficaciously follow medical recommendation regardless of appropriate cognitions and motivations.

Executive Functioning. Both parent and adolescent executive functioning is also likely to affect how and to what degree health beliefs relate to adherence/metabolic control. Executive functioning is a cognitive process that controls, organizes, and directs cognitive activity, emotional response, and behavior. Abilities related to executive functioning include deployment of attention, impulse control, self-regulation, initiation of activity, working memory, mental flexibility and utilization of feedback, planning and organization (Bull & Scerif, 2001; Isquith, Gioia, & Espy, 2004). Each of these abilities is critical to successfully adhering to a type 1 diabetes treatment regimen, which typically requires significant planning (i.e. remembering to bring a diabetes supplies when leaving home, bringing or knowing where to get appropriate food when needed) in order to be able to check blood glucose levels, strict diet management, and consistent exercise. Someone with type 1 diabetes also has to be able and prepared to respond to various situations appropriately and efficiently when challenges arise (i.e. knowing how to respond to a high or low blood glucose reading). While many of the skills necessary for good adherence fall into the executive functioning domain, researchers have only recently started to investigate the role of executive functioning in type 1 diabetes adherence.

Bagner et al. (2007) was the first to directly investigate child executive functioning and adherence in children with type 1 diabetes. Results confirmed a positive relationship between parent-report of child executive functioning and parent-report of child adherence in children and adolescents ages 8 to 19. Results of another study also supported the positive association between child executive functioning and adherence but added to the literature by reporting a negative relationship between child executive functioning and metabolic control that was mediated by adherence (McNally, Rohan,

Pendley, & Drotar, 2010). For example, a child with well-developed executive functioning abilities is likely to have lower HbA1c compared to a child with less developed executive functioning abilities because they adhere better to medical recommendations. Two other studies further confirmed a positive relationship between aspects of child executive functioning (cognitive flexibility, attentional control, emotion regulation; general executive functioning) and adherence in adolescents using both parent and adolescent report of executive functioning and adherence (Graziano et al.,2011; Duke & Harris, 2014).

Miller et al. (2013) was the first to investigate the effects of executive functioning on adherence over time. In their sample of 9 to 11 year olds, behavior regulation (the ability to shift cognitive set and moderate emotions and behaviors via emotional control) improved over a two-year period and this improvement was related to an increase in adherence. However, similar relationships were not found for the other executive functioning domain measured, metacognition (the ability to monitor, initiate, plan, organize, and sustain future-oriented problem solving and working memory). The authors proposed that limited change in children's metacognition scores across time and the possibility that parents are better able to accurately report on behavioral functioning (behavior regulation) than cognitive functioning (metacognition) may account for the discrepant findings across executive functioning domain. Together the executive functioning literature in type 1 diabetes suggests a strong link between more developed child executive functioning and better adherence and metabolic control but the nuances, longitudinal nature, and malleability of these relationships warrant further evaluation.

The relationship between parent executive functioning and type 1 diabetes adherence has not been examined. However, parent executive functioning is also likely related to adolescent adherence because of continued parental involvement throughout adolescence. Parents are encouraged to and often contribute to their adolescent's diabetes care in many ways including calculating carbohydrate intake, adjusting insulin, scheduling doctor's appointments, filling prescriptions, and bringing appropriate supplies when the parent and adolescent leave home. All of these activities require use of executive functioning abilities (i.e. planning, problem solving; Bagner et al., 2007). Further, integrating and acting on information from multiple sources (blood glucose monitoring, diet, exercise) is necessary for successful diabetes management and doing so will be problematic for both adolescents and parents with lower executive functioning (Duke & Harris, 2014) likely regardless of their cognitions about diabetes and adherence. Families may have appropriate and motivating health beliefs about diabetes but may lack the executive functioning to effectively implement the complex medical regimen required for diabetes management.

Depression. Increased symptoms of depression are relatively common in adolescents with type 1 diabetes; studies have estimated that rates of elevated depressive symptoms among adolescents with diabetes are three times higher than corresponding healthy adolescents (Grey, Whittemore, & Tamborlane, 2002). Rates of clinical depression in this population are estimated to be around 1 in 7, which is double the highest estimate in the general population (Stewart et al., 2005). Depressive episodes have also been shown to last longer in children and adolescents with diabetes compared to healthy controls (Kovacs, Drash, Mukerji, & Iyengar, 1995). Such prevalence and

intensity in children and adolescents with diabetes is concerning not only for the adolescent's psychological health but also their physical health. Adolescent depressive symptoms, whether reaching clinical levels or not, have been repeatedly shown to interfere with adherence to medical regimen and metabolic control (Korbel, Wiee, Berg, & Palmer, 2007; LaGreca, Swales, Klemp, Madigan, & Skyler, 1995; Grey, Genel, & Tamborlane, 1980; Grey, Cameron, & Thurber, 1991; Grey, Boland, Yu, Sulivan-Bolyai, & Tamborlane; Wiebe et al., 2011). High depression levels were also shown to be related to increases in diabetes related hospitalizations over a two year period (Stewart et al., 2005). Higher depressive symptoms in adolescents with type 1 diabetes have been found to relate to increased family conflict, decreased blood glucose monitoring, more negative affect related to blood glucose monitoring, and decreased feelings of self-efficacy about diabetes management (i.e. Korbel, Wiee, Berg, & Palmer, 2007; Stewart et al., 2005), all of which are known to negatively correlate with adherence and/or metabolic control (e.g. Laffel, 2003; Streisand, Swift, Wickmark, Chen, & Holmes, 2005). The negative correlates of depressive symptoms are hypothesized to be related to the negative impact that depression has on energy, motivation, concentration, and problem solving abilities, which are all essential to adherence in type 1 diabetes (McGrady & Hood, 2010). Further, some depressive symptoms, such as loss of energy and appetite disturbance, may negatively impact a child or adolescent's ability to effectively respond to bodily cues indicative of high or low blood glucose levels (McGrady & Hood, 2010). The evidence that clinical and subclinical levels of depressive symptoms negatively relate to health behaviors and outcomes in children with diabetes has made depression a commonly discussed factor in managing adherence to diabetes care (see Johnson, Eiser, Young,

Bierley, & Heller, 2013). An increased number of diabetes clinics across the country are screening for depression and referring children and adolescents with high levels of depressive symptoms to mental health providers (i.e. Hermanns et al., 2006).

The relationship between parental depression and pediatric diabetes adherence has received less attention. However, research does suggest that elevated levels of parental depressive symptoms are related to both increased depressive symptoms and poor adherence in adolescents with diabetes (i.e. Eckshtain, Ellis, Kolmodin, & Naar-King, 2009). It has also been theorized that parental depression can influence child adherence/metabolic control because depressive symptoms affect parenting behaviors related to diabetes (e.g. Jaser, Linsky, & Grey, 2014; Wiebe et al., 2011). For instance, Eckshtain, Ellis, Kolmodin, & Naar-King (2009) found that higher parental depressive symptoms were related to poorer metabolic control indirectly through decreased parental monitoring of diabetes care. Although the study was cross-sectional, results suggest that parent depressive symptoms influence their diabetes-related parenting behaviors because depressive symptoms are associated with lower motivation, decreased difficulty to organize/plan, and difficulty engaging with loved ones. Parent depressive symptoms have also been found to be correlated with quality of life and difficulties coping with diabetes in children with diabetes (see Neylon, O'Connell, Skinner, & Cameron, 2013). Further, findings suggest that coping difficulties and decreased family warmth mediate the relationship between maternal and child depressive symptoms, meaning that maternal depression may negatively affect child functioning through its influence on the child's coping and family functioning (Jaser, Whittermore, Ambrosino, Lindermann, & Grey, 2007). Parents that endorse elevated depressive symptoms have also been shown to have

more critical and non-supportive interactions with their adolescent's surrounding diabetes, which was correlated with increased family conflict as well as poor adherence and metabolic control (Jaser & Grey, 2010). Together this research demonstrates the possible negative impact of parent depressive symptoms on the parent's ability to properly support, monitor, and assist in their adolescent's adherence to medical regimen.

In the same way that executive functioning may interfere in the relationship between appropriate cognitions and health behaviors, depression may also limit a parent or adolescent's capability to consistently adhere to a complex diabetes regimen. Understanding how depressive symptoms influence this relationship is important in tailoring treatment most effectively, particularly given the high rates of depressive symptoms in this adolescent population. Together these types of moderators (responsibility sharing, parental emotional support, executive functioning, and depression) may provide a broader picture of the applicability of the HBM in pediatric diabetes.

Purpose

Although a handful of studies have assessed the applicability of the HBM to type 1 diabetes, none have integrated parent and adolescent beliefs together in the same model. Many have also added variables to the original HBM, limiting specific conclusions that can be made. One of the goals of the current study was to understand the specific relationship between various parent and adolescent health cognitions and adherence in youth with type 1 diabetes while taking into account variables such as age, gender, ethnicity, and family income. Unlike the other four components of the original

HBM (as measured by the DHBQ) the “cues to adherence” component of the model has not shown adequate internal reliability or validity and was not used in the current model.

The impact of other parent and adolescent variables on the HBM and adherence relationship have also not been investigated despite evidence that a number of variables could interfere with discrete adherence behaviors regardless of cognitions or intentions. The current study aimed to understand the combined effects of parent and adolescent health beliefs on adherence and metabolic control as well as the specific beliefs that account for the most variance in adherence behavior and metabolic control. Further, the study aimed to test the moderating effects of amount of parent responsibility for diabetes management, parent emotional support related to diabetes, parent/adolescent depressive symptoms and parent/ adolescent executive functioning on the HBM and adherence/metabolic control relationships. Understanding these relationships could help identify cognitive patterns within families that are problematic as well as family dynamics and/or parent/adolescent difficulties that interfere with adherence despite appropriate cognitions. This understanding could help to make psychological treatment for diabetes adherence more targeted and effective.

Hypotheses

1. A significant relationship will exist between adolescent health beliefs and self-reported adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.
    a. Adolescents that believe they have higher personal susceptibility to and the severity of diabetes complications (Severity Susceptibility composite

of the DHBQ) will have better metabolic control and lower reported adherence/less frequent blood glucose checks. Adolescents that perceive the cost of adherence as higher than the (Cost-Benefit composite of the DHBQ) will have better metabolic control and lower reported adherence/less frequent blood glucose checks.

2. Parent health beliefs including both Parent Cost-Benefit and Parent Severity Susceptibility will be significantly related to adolescent-reported adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.
    a. It was hypothesized that Parent Severity Susceptibility and Parent Cost-Benefit would be inversely related to adherence and positively related to metabolic control.
    b. Previous research on parent reported health beliefs has suggested that parent beliefs regarding their child's susceptibility to diabetes complications and the severity of diabetes and its complications accounted for the most variance in child/adolescent adherence (Bond, Aiken, & Somerville, 1992). Given these previous findings it was hypothesized that when examining the individual effects of each parent health belief composite within the proposed model, the Severity Susceptibility variable will account for the most variance in adolescent report of adherence, frequency of blood glucose monitoring, and metabolic control.
3. When examining adolescent and parent health beliefs in multiple regression, it was predicted that both parent and adolescent health belief composites (Cost-

Benefit and Severity Susceptibility) would significantly relate to adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.

   a. In a model including both parent and adolescent health beliefs, both parent and adolescent's Cost-Benefit and Severity Susceptibility beliefs would positively relate to adolescent report of adherence and frequency of blood glucose monitoring and negatively with metabolic control.

4. Parent degree of responsibility for diabetes tasks will moderate the relationship between parent/adolescent health beliefs and adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.

   a. It was hypothesized that when taken together, parent's health beliefs (both Cost-Benefit and Severity Susceptibility) would account for more variance in adolescent report of adherence, frequency of blood glucose monitoring, and metabolic control than adolescent beliefs (both Cost-Benefit and Severity Susceptibility) when parents reported more responsibility for disease management while adolescent health beliefs (both Cost-Benefit and Severity Susceptibility) would account for more variance in adherence and metabolic control for families in which parents reported less responsibility for management.

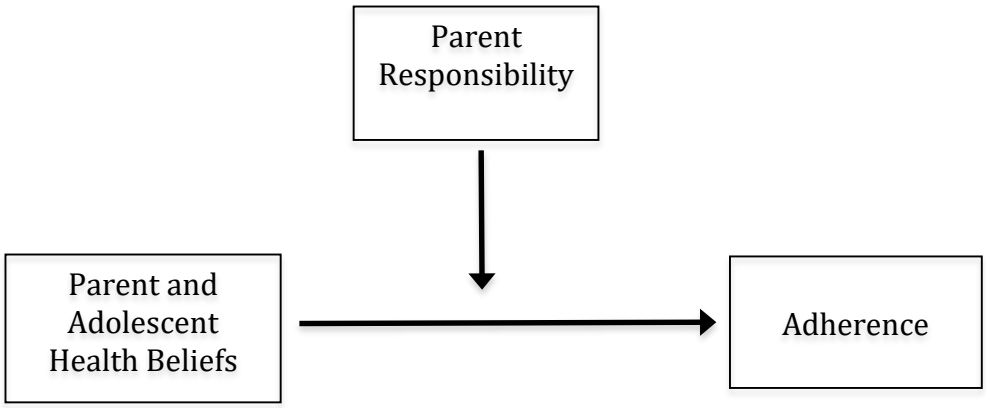


Figure 2. Illustration of parent responsibility as a moderator between parent/adolescent health belief and adolescent adherence

5. Adolescent perception of parental emotional support related to diabetes will moderate the relationship between parent/adolescent health beliefs and adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.
    a. It was hypothesized that parent health beliefs (both Cost-Benefits and Severity Susceptibility) would account for more variance in adolescent adherence, frequency of blood glucose monitoring, and metabolic control than adolescent beliefs (both Cost-Benefits and Severity Susceptibility) when adolescent's report feeling more parental emotional support related to diabetes, however, neither parent or adolescent health beliefs would account for significant variance in adolescent report of adherence, frequency of blood glucose monitoring, and metabolic control when adolescents reported feeling less parental emotional support related to diabetes.

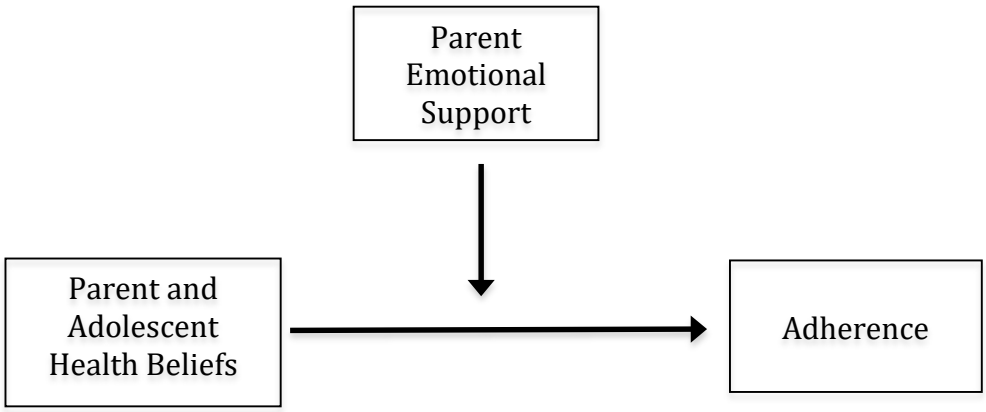


Figure 3. Illustration of perceived parent emotional support as a moderator between parent/adolescent health belief and adolescent adherence

6. Parent and adolescent executive functioning abilities will moderate the relationship between parent/adolescent health beliefs and adherence, frequency of blood glucose monitoring, and metabolic control, respectively, after controlling for gender, age, ethnicity, and family income.
    a. It was predicted that a three-way interaction would exist between parent/adolescent health beliefs (Parent Cost-Benefit, Parent Severity Susceptibility, Adolescent Cost-Benefit, Adolescent Severity Susceptibility), adolescent executive functioning, and parent executive functioning. Parent/ adolescent health beliefs would be more significantly and positively related to adherence and more negatively related to metabolic control when both parents and adolescents have higher executive functioning ability. However, if either or both parent and/or adolescent have lower executive functioning the relationship between parent/adolescent health beliefs would not be as strongly related to adherence and metabolic control.

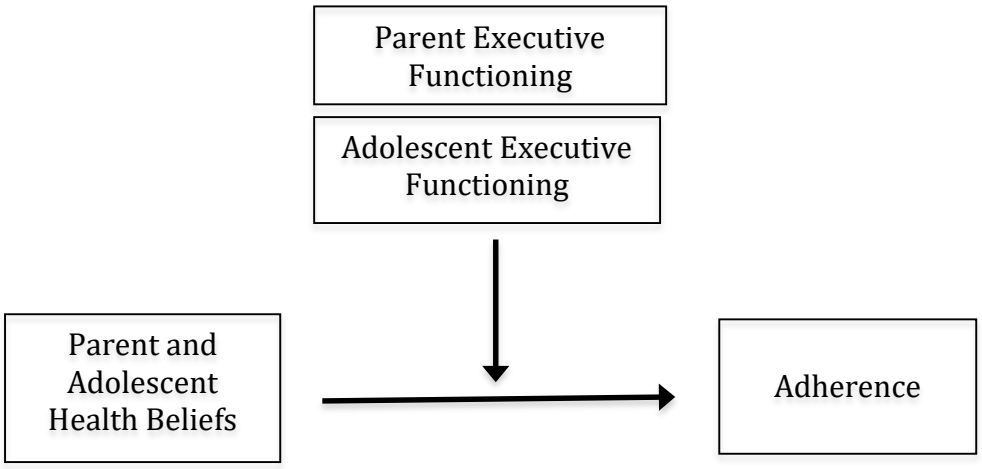


Figure 4. Illustration of the interaction between parent and adolescent executive functioning as a moderator on the parent/adolescent health belief and adherence relationship

7. Both parent and adolescent depressive symptoms will moderate the relationship between parent/adolescent health beliefs and adherence and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.
    a. It was predicted that parent/ adolescent health beliefs would be positively related to adherence and negatively related to metabolic control when both parents and adolescents endorsed lower levels of depressive symptoms. However, parent/adolescent health beliefs would not be related to adherence or metabolic control if the parent and/or adolescent endorsed higher levels of depression.

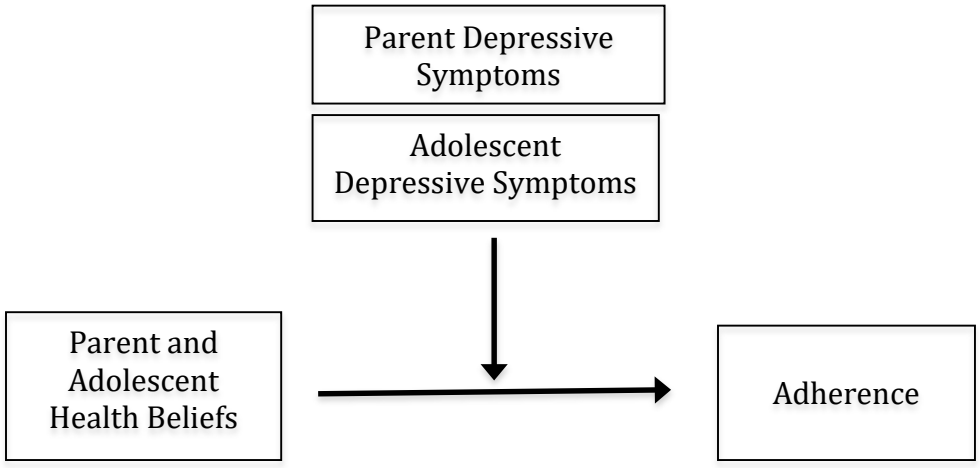


Figure 5. Illustration of the interaction between parent and adolescent depressive symptoms as a moderator on the parent/adolescent health belief and adherence relationship

Methods

Participants

One hundred and twelve adolescents between the ages of 12 and 17 with Type 1 diabetes were recruited along with one legal guardian. Participants were recruited through endocrine clinics affiliated with University Hospitals Rainbow Babies and Children's Hospital with the proper Institutional Review Board (IRB) approval.

Procedure

Potential participants were identified through clinic rosters. Active recruitment took place in person during diabetes endocrine clinics. During the visits, interested caregivers and adolescents were approached by the primary investigator to provide information about the study and to determine eligibility. Eligible participants were those between 12 and 17 years old with a diagnosis of type 1 diabetes, without a diagnosis of

cognitive or developmental delay, and accompanied by a primary caregiver. Caregivers and adolescents also had to be fluent in reading and writing English. Eligible and interested participants and one of their primary caregivers provided written consent and completed questionnaires while in clinic. Of the 124 adolescents/caregivers approached 118 agreed to participate and 112 completed and returned all study questionnaires. Participants could also choose to take the questionnaires and an addressed and stamped envelope with them to complete at a later time and mail back to the primary investigator. Participants (both adolescent and parent) were given a unique study code number to protect confidentiality and privacy. All data was de-identified and stored in locked file cabinets and password-protected files. Only University Hospitals IRB approved co-investigators and research assistants had access to data files.

Parent Report Measures

Sociodemographic Information. Background sociodemographic data was obtained using a questionnaire developed by study investigators. Parents were asked questions about family demographics, family income, parent educational history, and child medical history. Ethnicity was coded for analyses based on participant responses as (1) Asian American, (2) Black/African American, (3) Hispanic/ Latino, (4) Mixed/Other, and (5) Caucasian. However, because of the limited number of non- Caucasian or Black/African American participants the Ethnicity variables used in data analysis was dichotomous in nature with (1) Caucasian and (2) Minority. Family income was coded as (1) < $20,000 per year, (2) $20,000 – $50, 000 per year, (3) $50,000 – $80,000 per year, (4) $80,000 – $100,000 per year, (5) $100,000 – $200,000 per year, (6) $200,000 – $500,000, and (7) > $500,000 and used in this way for data analysis.

Diabetes Health Belief Questionnaire – Parent (DHBQ-P) The Diabetes Health Belief Questionnaire (DHBQ; Brownlee- Duffeck et al., 1987), a measure utilizing the HBM framework was adapted for the current study (DHBQ-P). Questions remained consistent with DHBQ except for changes in the subject (you vs. your child) of each statement. For example, "Controlling my diabetes well imposes restrictions on my whole lifestyle" was altered to say: "Controlling my child's diabetes well imposes restrictions on my whole lifestyle." The original DHBQ has 27 items and five subscales, however, in the current study one subscale was excluded, cues to adherence, because the subscale has consistently shown poor reliability and validity. The DHBQ-P used in the current study had 20 items and four subscales; perceived severity of diabetes and its complications, perceived susceptibility to diabetic complications, perceived benefits of adherence to diabetic regimen, and perceived costs of adherence. Parents responded to each statement on a five-point likert scale ranging from "not serious" to "extremely serious" on the severity subscale; "1-19% chance" to "80-99% chance" on the susceptibility subscale; "minor inconvenience" to "terrible for me" on the costs subscale; and "has no effect" to "extremely helpful" for the benefits subscale. Summing the rating of all items in that subscale derives a composite for each subscale. Each of the four subscale scores was used in the current study in the form of two composites: Cost-Benefit (costs to adherence minus benefits to adherence) and Severity Susceptibility (perceived severity subscale plus perceived susceptibility). Higher scores on the Cost-Benefit composite represent higher perceived costs of adherence to quality of life than perceived benefits and lower scores represent the perception of higher benefits of adherence than costs. Higher scores on the Severity Susceptibility composite represent higher perceived severity of disease and

higher perceived susceptibility to diabetes complications. As the DHBQ-P used in this study was adapted for parent-report, there are not reliability and validity statistics available. However, the internal reliability of each subscale on the original DHBQ from which the DHBQ-P was adapted (Perceived Benefits, Perceived Susceptibility, and Perceived Costs) is sufficient (α = .66 - .78). Further, both the composites and total Health Belief score used in the current study have shown adequate reliability using the original DHBQ (Bond et. al., 1992). Concurrent validity of the original DHBQ has been shown by demonstrating appropriate relationships with standardized measures of diabetes appraisal, anxiety, depression, diabetic daily hassles, and perceived stress (Carey et al., 1990). Internal reliability of the total DHBQ-P in the current study proved to be adequate (α = .72) as were the two composites (Cost-Benefit, α = .70, Severity Susceptibility, α = .82).

Depression, Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a 21-item self-report measure that assesses depression, anxiety, and stress. It was used in the current study as a measure of parent depressive symptoms. There are 7 items for each emotional state. Each item is scored on a 4-point scale ranging from 0 (did not apply to me at all) to 3 (applies to me very much or most of the time). Scores on each subscale are summed then multiplied by 2, yielding subscale scores that range from 0-42. The DASS-21 has good internal reliability with the α's of each subscale ranging from .87 to .94 (Antony, Bieling, Cox, Enns, & Swinson, 1998) and construct validity with each DASS-21 subscales being appropriately correlated with widely used measures of the depression and anxiety (i.e. The Beck Depression Inventory,

Beck Anxiety Inventory, and the State and Trait Anxiety Inventory; Antony, Bieling, Cox, Enns, & Swinson, 1998). The depression subscale of the DASS-21 was used in the current study and the internal reliability (α) of the depression subscale was .838.

The Diabetes Related Executive Functioning Scale – Parent Report (DREFS-P-P; Duke & Harris, 2014). The DREFS-P is a 77 item parent-report measure of child/adolescent diabetes-specific executive functioning ability. The original DREFS-P has 11 subtests related to 11 domains of diabetes related executive functioning including planning, organizing materials, task initiation, monitoring of actions, mental flexibility, time management, emotion regulation, inhibition, distractibility, memory, and sequential task completion. Each item is scored on a likert scale from 1 (never) to 5 (always). Three of the DREFS-P subscales (planning, inhibit, sequential task completion) were completed by participants in the current study to limit participant burden and a composite of these subscales was used as a general measure of diabetes-specific adolescent executive functioning. These 3 subscales were chosen because they were shown to be strongly related to the total DREFS-P score (correlations above .8) higher subscale scores indicate higher endorsed executive functioning abilities in each of the executive functioning subscale areas. Each of the subscales used in the current study have previously shown high internal consistency ($\alpha > .9$). Concurrent validity was demonstrated by a high and positive correlation between the DREFS-P and the BREIF, the gold standard of general executive functioning ability (Duke & Harris, 2014). Internal consistency of each subscale used in the current study was good ($\alpha > .80$) as was the internal consistency of the composite used ($\alpha = .89$).

Barkley Deficits in Executive Functioning Scale, Short form (BDEFS-S; Barkley, 2011). The BDEFS-S is a 20 item self-report measure of adult executive functioning. The BDEFS-S was used to measure parent executive functioning in the current study. The BDEFS-S has a total score that includes five subscales: self-management, self-organization/ problem solving, self-restraint, self-motivation, and self-regulation of emotion. The BDEFS-S total scores subscales have high internal consistency (α = .91 - .96) and sufficient concurrent and discriminative validity, with positive correlations between total and subscales scores and various measures of functional impairment known to be related to executive functioning (i.e. family functioning, peer relations, and education functioning; Barkley, 2011). The BDEFS-S total score was used as a general measure of parent executive functioning in the current study with higher scores indicating higher endorsed executive functioning ability. Internal reliability was excellent with an α of .901.

Adolescent Report Measures

Diabetes Health Belief Questionnaire (DHBQ; Brownlee- Duffeck et al., 1987). The DHBQ is a measure utilizing the HBM constructs as its framework. The DHBQ has 27 items and five subscales, however, in the current study (as with the DHBQ-P) only four subscales were used: perceived severity of diabetes and its complications, perceived susceptibility to diabetic complications, perceived benefits of adherence to diabetic regimen, and perceived costs of adherence. Cues for Adherence was not included in the current study because the subscale has shown inadequate reliability and validity. Adolescents responded to each statement on a five-point likert scale ranging from “not

serious" to "extremely serious" on the severity subscale; "1-19% chance" to "80-99% change" on the susceptibility subscale; "minor inconvenience" to "terrible for me" on the costs subscale; "has no effect" to "extremely helpful" for the benefits subscale; and "can never tell" to "can always tell" on the cues to action subscale. Summing the rating of all items in that subscale derives a subtest score for each subscale. Subscales were used in the current study to form two composites (Cost-Benefit (costs to adherence minus benefits to adherence) and Severity Susceptibility (perceived severity subscale plus perceived susceptibility). Higher scores in the Cost-Benefit composite indicate higher perceived costs of adherence and lower scores indicate higher perceived benefits. Higher scores in the Severity Susceptibility composite indicate higher perceived severity of illness and higher susceptibility to disease complications. The DHBQ has been used in children and adults 12 years old and over (e.g. Patino et al., 2005). The internal reliability of the total DHBQ was sufficient with an α of .74. The internal reliability of each subscale on the DHBQ used in the current study (Benefits, Costs, Susceptibility, and Severity) is sufficient as are the composites of Cost-Benefit and Severity Susceptibility (Severity Susceptibility referred to in Patino et al., 2005 as Threat Perception; α = .66 - .78). Concurrent validity has been shown by demonstrating differential relationships between subscales of the DHBQ and standardized measures of diabetes appraisal, anxiety, depression, diabetic daily hassles, and perceived stress (Carey et al., 1990). Current internal reliability was good for each of the composites used (Cost-Benefit α = .78, Severity Susceptibility α = .71) and the HBM total score used (α = .75)

Diabetes Family Behavior Scale (DFBS; McKelvey et al., 1993). The DFBS is a 47 item self-report measure of adolescent perception of family support related to the management of type 1 diabetes. Items on the DFBS are scored along a five-point scale ranging from (1) this happens all the time in my family to (5) this never happens in my family. The DFBS is divided into two subscales, Guidance-Control and Warmth-Caring. After reverse scoring several items they can be summed to produce a total score for each subscale and both subscales can be summed to get an overall Total Score of family emotional support. The Warmth-Caring subscale was utilized in the current study as an indicator of parent emotional support with higher scores on the Warmth-Caring subscale representing higher family emotional support. The DFBS and its subscales have shown adequate internal consistency (α's ranging from .79 to .81; McKelvey et al., 1993) in an adolescent population. Concurrent and construct validity have also been demonstrated with validated measures of family and emotional support (McKelvey et al., 1993). The internal reliability of the DFBS in the current study was good with an α of .80.

Diabetes Family Responsibility Questionnaire (DFRQ; Anderson et al., 1990). The DFRQ is a 17 item self-report measure of parent and child assumed responsibility in the management of type 1 diabetes. Items on the DFRQ are scored along a three-point scale including (1) child takes or initiates responsibility for this almost all of the time, (2) parent(s) and child share responsibility for this about equally," and (3) "parent(s) takes or initiates responsibility for this almost all of the time." Parent responsibility in this measure refers to general parent responsibility not responsibility of a specific parent. Responses for each item are totaled to produce an overall Parent Responsibility Score.

Lower scores indicated that the adolescent has more responsibility for their treatment regimen and higher scores indicated that the parent has more responsibility for the treatment regimen. The internal consistency of the DFRQ has been demonstrated in a sample of adolescents and their parents (α = .74; Anderson et al., 1990). Concurrent and construct validity have also been demonstrated with validated measures of family environment (Anderson et al., 1990). The DFRQ in the current study had an internal reliability of α = .74.

Self Care Inventory- Revised (SCI-R; La Greca, 1992). Adolescent adherence to prescribed diabetes self-care regimen was assessed with the SCI-R. The SCI-R is a 14-item self-report measure used to assess patient perception of treatment adherence over the past month in patients diagnosed with type 1 diabetes. Participants ranked how often they perform certain adherence behaviors on a 5 point likert scale with 1 indicating they never do it and 5 indicating they always do as recommend. Patients could also indicate if items were not applicable to them. A Total Adherence score was obtained by summing the items and dividing them by the total number of items. For a total score to be valid, participants needed to complete at least 85% of the measure (12 items). Higher scores indicated better adherence. Internal consistency of the SCI-R has been demonstrated in adolescent populations (α = .80; Weiner, Butler, Welch, & La Greca, 2005). The total score on the SCI-R has been positively correlated with and measures of self-care autonomy and psychological maturity (Wysocki et al., 1996). Construct validity was supported by positive association between the SCI-R and metabolic control

independently from anxiety and depression (La Greca et al., 1995). The internal reliability of the SCI-R in the current study was $\alpha = .84$.

Child Depression Inventory 2nd Edition (CDI2; Kovacs, 1992) The CDI2 is a 27 item self-report measure of depressive symptoms in children and adolescents that was based off of the Beck Depression Inventory (BDI), a well-established measure of adult depressive symptoms. For each item children are instructed to choose which of three statements best describes them over the past two weeks. The statements range in degree of severity and are scored on a 3 point likert scale. For example, one item's statements range from 0 "I like myself" to 2 "I hate myself." The questions cover symptoms associated with depression such as worry, self-blame, loneliness, sleep disturbance, and somatic concerns. Scores range from 0 to 54 with higher scores indicating higher levels of depressed mood. After certain items have been inverse scored, items can be summed to produce a Total CDI score. Although the CDI2 has 5 subscales; Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and Negative Self Esteem, only the Total CDI score was used in the current study. The CDI2 has good internal reliability ($\alpha = .89$) and the validity of the CDI2 has been well established (Pearson, 2014). In the current study reliability was adequate with an alpha coefficient of .81.

Objective Measures

Metabolic Control. Adolescent's most recent HbA1c level were obtained as an objective measure of metabolic control. HbA1c reflects the stability of an individual's blood glucose over the last 8-12 weeks and offers an objective measure of diabetes health

status. HbA1c is considered the most reliable and commonly used objective measure of blood glucose control (Sacks, 2007).

Frequency of blood glucose monitoring. Adolescents are required to bring their blood glucose meter(s) to their endocrine appointments in order for doctors to use the digital information on the meter to gain information about the adolescent's blood glucose levels over time as well as the number of times the adolescent checks their blood glucose. One data point gathered from downloads of meter information is frequency of blood glucose monitoring per day over the last 20-30 days. In the current study frequency of blood glucose checks (e.g. monitoring) was used as an additional objective measure of adolescent adherence.

Data Analysis Plan

Multiple regression analyses were used to examine the relationship between adolescent health beliefs (Cost-Benefit and Severity Susceptibility) and adolescent report of adherence (SCI-R), average daily blood glucose checks, and HbA1c, respectively. Three regressions examined the relationship between parent health beliefs (Cost-Benefit and Severity Susceptibility as measured by the DHBQ-P) and adolescent report of adherence (SCI-R), frequency of blood glucose monitoring and HbA1c, respectively.

To test the model of combined parent and adolescent health beliefs, the covariates being controlled for (age, gender, family income, ethnicity) were entered into Step One of the regression and each parent and adolescent health belief composites (Cost-Benefit and Severity Susceptibility) were entered together in Step Two of the regression analyses as predictors of adolescent report of adherence (SCRI-R), frequency of blood glucose monitoring, and HbA1c, respectively.

Multiple regressions analyses were used to test the hypothesis that amount of parent responsibility for disease management moderated the relationship between parent and adolescent health beliefs (health beliefs defined as Cost-Benefit and Severity Susceptibility composites) and adolescent report of adherence (SCI-R). Covariates (age, gender, ethnicity, family income) were entered in Step One of the regression. Parent Cost-Benefit, Parent Severity Susceptibility, Adolescent Cost-Benefit, and Adolescent Severity Susceptibility, and Parent Responsibility were entered in Step Two, and Parent Severity Susceptibility X Parent Responsibility, Parent Cost-Benefit X Parent Responsibility, Adolescent Cost-Benefit X Parent Responsibility, and Adolescent Severity Susceptibility X Parent Responsibility were entered in Step Three of the regression analysis. The outcome variable in this analysis was adolescent report of adherence (SCI-R). The moderating effect of adolescent perception of parent emotional support on the relationship between parent and adolescent health beliefs and frequency of blood glucose monitoring and on the relationship between parent and adolescent health beliefs and HbA1c were each examined in the same way described above. If an interaction was statistically significant, interactions were then probed by comparing the simple slopes of each interaction at varying levels of the moderating variable (Dearing & Hamilton, 2006; Preacher, Curran, & Bauer, 2006).

To test the hypothesis that both parent and adolescent executive functioning moderated the relationship between parent/adolescent health beliefs and adolescent report of adherence, hierarchical multiple regression was performed. Covariates (age, gender, ethnicity, family income) were entered in Step One of the regression. Parent health beliefs (Parent Cost-Benefit, Parent Severity Susceptibility), adolescent health beliefs

(Adolescent Cost-Benefit, Adolescent Severity Susceptibility), parent executive functioning (BDEFS-S), and adolescent executive functioning (DREFS-P) were entered in Step Two. The relevant two-way-interactions were entered into Step Three and the proposed three-way-interactions were entered into Step 4. The proposed four-way interactions were entered in Step 5 and the proposed five-way interactions were entered in in Step 6. This same procedure was followed using frequency of blood glucose monitoring and HbA1c as respective outcome variables. If interaction variables in earlier steps of the model were shown to be significant a separate regression analysis was completed to further understand the nature of the significant finding. Significant interactions were further examined by comparing the simple slopes of each interaction at varying levels of the moderating variable.

Multiple hierarchical regression was used to test the hypothesis that both parent and adolescent depressive symptoms would moderate the relationship between parent/adolescent health beliefs and adolescent report of adherence. Covariates (age, gender, ethnicity, family income) were entered in Step One of the regression. Parent Cost-Benefit, Parent Severity Susceptibility, Adolescent Cost-Benefit, Adolescent Severity Susceptibility, parent depressive symptoms (DASS-21), and adolescent depressive symptoms (CDI) were entered in Step Two. The proposed two-way interactions were entered in Step Three. The proposed three-way-interactions were entered into Step 4. The proposed four-way interaction was entered in Step 5. The same analyses were performed using frequency of blood glucose monitoring and HbA1c as outcome variables. If interaction variables in earlier steps of the model were shown to be significant a separate regression analysis was completed to further understand the nature

of the significant finding. Significant interactions were further examined by comparing the simple slopes of each interaction at varying levels of the moderating variable. For an illustration of the moderation models see Figures 2, 3, 4, and 5.

Due to the number of analyses the Holm-Bonferroni Step Down method (Holm, 1979) of significance level adjustment was used when interpreting results. Significance values using the same predicting variables with different outcome variables were adjusted based on this method and individual coefficients were interpreted based on the adjusted p-value for that specific regression.

Results

Prior to hypotheses testing, descriptive statistics and correlations among the study variables were examined. The sample consisted of 55 males and 57 females with an average age of 14.69 (1.547). Caregivers participating included 68.8% mothers, 15.2% fathers, 0.9% Step-Mothers, and 0.9% Other Relatives. Seventy-five percent of the sample classified their ethnicity as Caucasian, 18% African American/Black, 3.5% Mixed, 0.9% Asian/Asian American, 0.9% Hispanic/Latino, and 0.9% Other. The average HbA1c of the sample was 8.99 (1.699) and the average frequency of daily blood glucose monitoring was 4.64 (2.602). For a list of the mean, standard deviation, and range of all study questionnaires see Table 1.

Parent depressive symptoms were notably lower in the current sample than would be expected based on previous research. Henry & Crawford (2005) found a DASS-21 depression mean of 11 when testing the psychometrics of the measure. Parent depressive symptoms in the current study had a mean of 2.7. However, this difference in findings should be interpreted within the context of both numbers falling within the “Normal”

range as defined by the authors. “Normal” is defined as 0-13 (Lovibond & Lovibond, 1995).

Adolescent’s depressive symptoms were slightly lower in the current study with 12% of adolescent participants meeting or exceeding the published clinical cut-off score of the CDI when past research has indicated that 15% of adolescent diagnosed with type 1 diabetes met or exceeded the cut-off. Other variables (DHBQ, DHBQ-P, BDEFS, DFBS, DFRQ, SCI, HbA1c) showed means and ranges consistent with previous studies using those measures in pediatric diabetes (e.g. Anderson et al., 1990; Barkley, 2011; Goldbeck & Bundschuh, 2007; Brownlee & Duffeck, 1987; Lewin et al., 2006; La Greca, 1992). Diabetes characteristics (HbA1c, frequency of blood glucose monitoring per day, self-reported adherence) of the current sample are also comparable to other recent studies of adolescents diagnosed with type 1 diabetes (e.g. Hessler, Fisher, Polonsky, & Johnson, 2016; Wiebe et al., 2014; Noser, Patton, Van Allen, Nelson, & Clements, 2016).

When looking at the three outcome variables used in the current study, metabolic control was negatively correlated with adolescent report of adherence (r = -.232) and frequency of blood glucose monitoring (r = -.326). A number of correlations between other study variables are also notable. Self-reported adherence (SCI) was significantly correlated with parent emotional support for diabetes care (r = .408) and adolescent executive functioning (r = .311). Metabolic control was positively correlated with adolescent cost-benefits (r = .304) and adolescent health beliefs (r = .309). Parent emotional support was negatively correlated with adolescent cost-benefit health beliefs (r = -.382) and adolescent severity and susceptibility health beliefs (r = -.417). Further, adolescent depressive symptoms were positively correlated with adolescent severity and

susceptibility health beliefs (r = .368) and negatively correlated with parent emotional support for diabetes care (r = -.410). Parent depressive symptoms were negatively related to parent executive functioning abilities (r = -.569). See Table 2 for correlations between all study variables. Despite these strong correlations, multicolinearity statistics for each regression analysis in the current study indicated multicolinearity assumptions were not violated by using a VIF cutoff of < 4 and a tolerance cutoff of > 0.2.

1. *A significant relationship will exist between adolescent health beliefs and self-reported adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.*

    Self- report of adherence: A hierarchical multiple regression analysis was completed to test the proposed adolescent health belief model. Results of the final step of analysis which included both covariates (age, gender, ethnicity, family income) and adolescent health beliefs (including both Cost-Benefit and Severity Susceptibility) was found to be significant with an outcome variable of self-reported adherence (R = .512, R^2 = .262, F (6,110) = 5.792, p < .001). Holm-Bonferroni significance adjustment was performed and a p-value of .017 was used for interpretation of the regression and individual coefficients within that regression. Despite the final model of the regression being significant and the model accounting for increased variance over step one of the analysis (R^2 Change = .066; F Change = 4.386; Sig. F Change = .015), neither Cost-Benefit nor Adolescent Severity Susceptibility significantly related to adherence. However, the covariates of Ethnicity and Age (entered in Block 1) were both found to account for significant variance in adherence (β = .234, SE = .643, t = 2.545, p =

.012; β = -.262, SE = .483, *t* = -2.946, *p* = .004). Those who identified as Caucasian were more likely to have higher adherence while those who identified as another ethnicity (i.e. Asian, Black, African American, Hispanic, Other) were more likely to have poor adherence. Age and adherence were inversely related meaning younger children were more likely to have better adherence. See Table 3.

Frequency of blood glucose monitoring: Hierarchical multiple regression analysis with demographics in Block 1 and Adolescent Cost-Benefit and Adolescent Severity Susceptibility in Block 2 indicated that the final model was not significant based on an adjusted p-value of .025 (F (6,110) = 1.543, *p* = .172; R = .294, R^2 = .086, R^2 Change = .053; F Change = 2.817; Sig. F Change = .065). None of the proposed variables were found to account for a significant amount of variance on an individual level. This included Adolescent Cost-Benefit and Severity Susceptibility. See Table 4.

HbA1c: The same multiple regression analysis as above was performed using the outcome variable of metabolic control. Results indicated that the final step of analysis including main effects and covariates was significant using the Holm- Bonferroni adjusted significance level of $p < .05$. (R = .448, R^2 = .200, F (6,110) = 4.090, *p* = .001), however, this step of analysis did not account for significantly more variance than previous steps not including proposed main effects (R^2 Change = .039; F Change = 2.393; Sig. F Change = .097). Neither Adolescent Cost-Benefit nor Adolescent Severity Susceptibility significantly related to metabolic control. However, the covariate of ethnicity was significantly related to HbA1c (β = -.238, SE = .134, *t* = -2.489, *p* = .015) indicating that

participants who identified as Caucasian were more likely to have better metabolic control. See table 5.

2. *Parent health beliefs including both Parent Cost-Benefit and Parent Severity Susceptibility will be significantly related to adolescent-reported adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.*

Self- report of adherence: The final step of multiple regression analysis including the two parent health belief composites (Cost-Benefit and Severity Susceptibility) and the outcome variable of adherence was significant after controlling for demographics using the Holm-Bonferroni adjusted p-value of .017 ($R = .496$, $R^2 = .246$, $F(6,110) = 5.320$, $p < .0001$). However, the final step of the analysis, when main effects were added to the model, did not account for significant added variance (using adjusted p-value of .017; R^2 Change = .050; F Change = 3.246; Sig. F Change = .043). Results indicated that neither Parent Cost-Benefit nor Parent Severity Susceptibility were significantly related to adherence. However, both adolescent Ethnicity and Age significantly related to adherence ($\beta = .267$, SE = .681, $t = 2.744$, $p = .007$; $\beta = -.223$, SE = .493, $t = -2.466$, $p = .015$). See Table 6.

Frequency of blood glucose monitoring: Multiple regression analysis controlling for age, gender, race, and income, using the independent variables of Parent Cost-Benefit and Parent Severity Susceptibility and the outcome variable of frequency of blood glucose monitoring was completed and found to be nonsignificant using a Holm Bonferroni adjusted p-value of .025 (final step

statistics: F (6, 96) = .970, p = .450, R = .237, R^2 = -.002, R^2 Change = .022, F Change = 1.157, Sig. F Change = .319). Findings indicated no significant relationships between Parent Cost-Benefit and Parent Severity Susceptibility and frequency of monitoring, respectively. See Table 7.

HbA1c: Multiple regression analysis was completed to examine the relationship between parent health beliefs and adolescent metabolic control while controlling for age, gender, race and income. Results indicated that the final model (including main effects and covariates) was significant using a Holm-Bonferroni Step Down adjusted significance value of $p < .05$ (R = .501, R^2 = .251, F (6,110) = 5.477, $p < .001$). Further, the step including main effects and covariates accounted for significantly more variance than the previous step in the regression (R^2 Change = .090; F Change = 5.884; Sig. F Change = .004). When investigating individual coefficients, findings indicated no significant relationship between Parent Cost-Benefit and metabolic control. Results suggested that Parent Severity and Susceptibility accounted for a significant portion of variance in metabolic control (β = .307, SE = .164, t = 3.147, p = .002). Indicating higher parent perception of disease severity and susceptibility to complications was worse metabolic control. Adolescent Ethnicity and Age were also significantly related to metabolic control (β = -.329, SE = .136, t = -3.387, p = .001; β = -.181, SE = .098, t = -2.00, p = .002). Younger adolescents and those that identified as Caucasian showed better metabolic control (lower HbA1c). See Table 8.

3. *When examining both adolescent and parent health belief composites in multiple regression it was predicted that both Parent and Adolescent Health Belief composites*

would significantly relate to adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.

Self-report of adherence: Results of multiple regression analysis in which demographic covariates were entered in the first step and adolescent and parent health beliefs main effects were entered in the second step indicated that the final model was statistically significant (final step statistics: R = .534, R^2 = .196, F (8, 96) = 4.77, $p < .001$) after applying an adjusted significance level of $p < .017$ but did not account for significantly more variance than the previous step using the adjusted significance level (R^2 Change = .089; F Change = 2.988; Sig. F Change = .023). None of the primary variables of interest were found to account for significant variance. This included Adolescent Cost-Benefit, Adolescent Severity Susceptibility, Parent Cost-Benefit, and Parent Severity Susceptibility. The covariate of adolescent Age was a significant predictor of adherence (β = -.238, SE = .498, t = -2.650, p = .009) indicating younger adolescents typically reported better adherence. See Table 9.

Frequency of blood glucose monitoring: The same hierarchical multiple regression analysis as above was used to test the adolescent and parent health belief model with an outcome variable of frequency of blood glucose monitoring. Findings indicated the final step of the regression was nonsignificant (F (8, 96) = 1.286, p = .260, R = .311, R^2 = .097, R^2 Change = .063, F Change = 1.674, Sig. F Change = .162) after the Holm Step Down procedure was applied ($p < .05$). Further, Adolescent Cost-Benefit, Adolescent Severity Susceptibility, Parent

Cost-Benefit, and Parent Severity Susceptibility were not found to significantly relate to frequency of blood glucose monitoring. See Table 10.

HbA1c: A hierarchical multiple regression analysis with demographic variables (Age, Gender, Ethnicity, and Income) in Block 1, parent and adolescent health beliefs in Block 2, and HbA1c as the outcome variable was completed and the final step of analysis was found to be statistically significant using a Holm-Bonferroni adjusted p-value of .025 ($R = .517$, $R^2 = .267$, $F (8,110) = 4.374$, $p < .001$). The final step of analysis including both main effects and covariates accounted for an increased amount of variance compared to previous steps (R^2 Change = .106, F Change = 3.468, Sig. F Change = .011). Parent Severity Susceptibility was found to be a significant predictor of HbA1c ($\beta = .281$, SE = .167, $t = 2.847$, $p = .005$). Adolescents with parents that perceived higher severity and susceptibility to disease complications had higher HbA1c levels (worse metabolic control). Findings indicated no significant relationship between the other main effects of interest, Adolescent Cost-Benefit, Adolescent Severity Susceptibility, or Parent Cost-Benefit. However, adolescent Ethnicity accounted for significant variance ($\beta = -.303$, SE = .138, $t = -3.075$, $p = .003$), with adolescents identifying as an ethnic minority being more likely to poor metabolic control. See Table 11.

4. *Parent degree of responsibility for diabetes tasks will moderate the relationship between parent/adolescent health beliefs and adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.*

Self-report of adherence: Hierarchical multiple regression testing the moderating effect of parent responsibility on the parent/adolescent health belief and adherence relationship was completed. The final step of the regression was significant ($R = .605$, $R^2 = .366$, $F (13,110) = 4.033$, $p < .0001$) using an adjusted p-value of .017. However, the step including the proposed interactions did not account for significantly more variance than previous regression steps (R^2 Change = .041, F Change = 1.475, Sig. F Change = .216). When investigating the individual variable coefficients, none of the main effects or 2-way interactions proposed were significant using a p-value of .017. This included the following 2-way interactions: Adolescent Cost-Benefit X Parent Responsibility, Parent Cost-Benefit X Parent Responsibility, Parent Severity Susceptibility X Parent Responsibility, and Adolescent Severity Susceptibility X Parent Responsibility. Ethnicity and Age were both significant in Model 1 of the regression, before main and interaction variables were entered into the regression ($\beta = .289$, $SE = .650$, $t = 3.103$, $p = .002$; $\beta = -.255$, $SE = .497$, $t = -2.793$, $p = .006$) indicating that identifying as Caucasian and being younger were both associated with better self-reported adherence. See Table 12.

Frequency of blood glucose monitoring: Hierarchical multiple regression was used to test the hypothesis that the relationship between parent and adolescent health beliefs and frequency of blood glucose monitoring is moderated by parent responsibility. The final step in the analysis including the proposed two-way interactions was found to be nonsignificant using the Holm-Bonferroni adjusted p-value of .05 ($F (13, 96) = .910$, $p = .546$, $R = .339$, $R^2 = .115$, R^2 Change = .017,

F Change = .447, Sig. F Change = .774). None of the proposed interactions were found to be significant. These interactions included: Parent Severity Susceptibility X Parent Responsibility, Adolescent Severity Susceptibility X Parent Responsibility, Parent Cost-Benefit X Parent Responsibility, and Adolescent Cost-Benefit X Parent Responsibility. See Table 13.

HbA1c: Hierarchical multiple regression was used to test the hypothesis that parent responsibility moderates the relationship between parent/adolescent health beliefs and metabolic control. Results indicated that the final step of the regression analysis was significant using an adjusted p-value of $p < .025$ ($R = .548$, $R^2 = .300$, $F(13,110) = 2.999$, $p = .001$). Despite the final step of the analysis being significant it did not account for additional variance beyond that accounted for in previous steps of the regression (R^2 Change = .028, F Change = .899, Sig. F Change = .468). When looking at Model 2 of the analysis ($R = .522$, $R^2 = .272$, $F(13,110) = 3.950$, $p < .0001$), which included main effects, there was a significant main effect for Parent Severity Susceptibility, ($\beta = .279$, SE = .167, $t = 2.819$, $p = .006$). Higher parent perception of severity and susceptibility to disease complications was related to worse metabolic control, as measured by higher HbA1c. Ethnicity was also a significant predictor of HbA1c in the final step of the model ($\beta = -.312$, SE = .139, $t = -3.141$, $p = .002$) indicating that participants identifying as Caucasian are more likely to have a better metabolic control. No significant relationships were found between Adolescent Severity Susceptibility X Parent Responsibility, Adolescent Cost-Benefit X Parent

Responsibility, Parent Severity Susceptibility X Parent Responsibility, or Parent Cost-Benefit X Parent Responsibility and adolescent HbA1c. See Table 14.

5. *Adolescent perception of parental emotional support related to diabetes will moderate the relationship between parent/adolescent health beliefs and adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.*

Self-report of adherence: Hierarchical multiple regression results indicated that the final step of the proposed model that included the 2-way interactions was statistically significant using the adjusted significance level of $p < .017$ ($R = .623$, $R^2 = .388$, $F(13,110) = 4.443$, $p < .001$). However, the final step of the analysis did not account for more variance than the previous steps of analysis including only main effects and covariates (R^2 Change = .030, F Change = 1.110, Sig. F Change = .357). Despite this, the main effect of Parent Emotional Support was found to account for a significant amount of variance in adherence ($\beta = .352$, SE = .858, $t = 3.506$, $p = .001$). Meaning adolescents who reported higher parent emotional support for diabetes care also reported higher self-reported adherence. Age was also significantly related to adherence ($\beta = -.267$, SE = .468, $t = -3.100$, $p = .003$) suggesting that younger adolescents reported higher adherence. The interactions proposed in the model were nonsignificant and included Adolescent Cost-Benefit X Parent Emotional Support, Adolescent Severity Susceptibility X Parent Emotional Support, Parent Cost-Benefit X Parent Emotional Support, and Parent Severity Susceptibility X Parent Emotional Support. See Table 15.

Frequency of blood glucose monitoring: The parent emotional support moderation model proposed was tested using hierarchical multiple regression with Frequency of Blood Glucose monitoring as the outcome variable. The final step of the regression that included the proposed interaction variables was found to be nonsignificant and did not account for significantly more variance than previous steps of the analysis (F (13, 96) = 1.095, p = .373, R = .368, R^2 = .135, R^2 Change = .028, F Change = .741, Sig. F Change = .567). Hierarchical multiple regression results indicated that Parent Cost-Benefit X Parent Emotional Support, Adolescent Cost-Benefit X Parent Emotional Support, Adolescent Severity Susceptibility X Parent Emotional Support, and Parent Severity Susceptibility X Parent Emotional Support did not account for significant variance in frequency of blood glucose monitoring using an adjusted p-value of .05. See Table 16.

HbA1c: Hierarchical multiple regression testing the Parent Emotional Support moderation model with HbA1c as the outcome variable was completed. The final step of the regression including the interaction variables proposed was found to be significant (R = .525, R^2 = .276, F (13,110) = 2.664, p = .003) based on the adjusted p-value of .025. The final step did not account for significantly more variance in HbA1c than previous steps of the analysis (R^2 Change = .008, F Change = .264, Sig. F Change = .900). However, results indicated that the main effect of Parent Severity Susceptibility positively and significantly related to metabolic control (β = .293, SE = .174, t = 2.851, p = .005), which indicated that higher parent Severity Susceptibility was related with worse metabolic control. None of the interaction variables in the model were significantly related to

metabolic control. These interactions included Adolescent Cost-Benefit X Parent Emotional Support, Adolescent Severity Susceptibility X Parent Emotional Support, Parent Cost-Benefit X Parent Emotional Support, and Parent Severity Susceptibility X Parent Emotional Support. See Table 17.

6. *Parent and adolescent executive functioning abilities will moderate the relationship between parent/adolescent health beliefs and adherence, frequency of blood glucose monitoring, and metabolic control, respectively, after controlling for gender, age, ethnicity, and family income.*

Self-report of adherence: Hierarchical multiple regression was used to test the proposed parent/adolescent executive functioning moderation model with an outcome of adolescent adherence. The final step of the regression was not found to be significant after Holm-Bonferroni adjustment ($p < .017$; R = .860, R^2 = .739, F (18,110) = 1.505, p = .110, R^2 Change = .077, F Change = 1.137, Sig. F Change = .373). See Table 18.

Frequency of blood glucose monitoring: Hierarchical multiple regression analysis was performed to test the moderating effect of parent/adolescent executive functioning on the parent/adolescent health belief and frequency of blood glucose monitoring relationship. Regression results were not statistically significant (R = .852, R^2 = .725, F (18,110) = 1.003, p = .519, R^2 Change = .036, F Change = .636, Sig. F Change = .700). See Table 19.

HbA1c: The final step of the hierarchical multiple regression investigating parent/adolescent executive functioning moderation model was not statistically significant using an adjusted p-value of .025 (R = .858, R^2 = .737, F

(18,110) = 1.178, p = .319, R^2 Change = .016, F Change = .348, Sig. F Change = .906). However, Model 4 of the analysis, which included all covariates, main effects, two-way interactions, and three-way interactions was significant (R = .793, R^2 = .628, F (18,110) = 1.845, p = .018). Within Model 4 the main effects of Parent EF and Parent SS, the two-way interaction Parent EF X Adolescent EF, and the three-way interaction Parent CB X Parent SS X Adolescent SS were each significantly related to HbA1c (β = -.538, SE = .320, t = -2.824, p = .007; β = -.346, SE = .294, t = 2.003, p = .051; β = -.436, SE = .391, t = -2.299, p = .026; β = .542, SE = .386, t = 2.494, p = .016). See Table 20.

To ensure significant findings in early steps of the analysis indicated meaningful information, independent follow-up regressions were performed. The regression analysis for the three-way interaction included Demographic variables in Block 1, Parent Cost-Benefit, Parent Severity Susceptibility, and Adolescent Severity Susceptibility variables in Block 2, the two-way interaction variables of Parent Cost-Benefit X Parent Severity Susceptibility, Parent Cost-Benefit X Adolescent Severity Susceptibility, Parent Severity Susceptibility X Adolescent Severity Susceptibility in Block 3, and the three-way interaction variable of Parent Cost-Benefit X Parent Severity Susceptibility X Adolescent Severity Susceptibility was entered in Block 4. Results indicated that the overall model was significant using a p-value of .05 (R = .548, R^2 = .300, F (11,110) = 3.608, p = .001), while the addition of the interaction variable in Model 4 did not account for increased variance of metabolic control (R^2 Change = .020, F Change = 2.393, Sig. F Change = .126). See Table 21.

A follow-up regression analysis for the significant two-way interaction variable Parent Executive Functioning X Adolescent Executive Functioning was completed. Demographics were entered in Block 1, the main effects of Adolescent Executive Functioning and Parent Executive Functioning were entered in Block 2, and the 2-way interaction variable of Parent Executive Functioning X Adolescent Executive Functioning were entered in Block 3. The regression analysis was found to be significant ($R = .539$, $R^2 = .291$, $F (11,110) = 5.097$, $p < .0001$, R^2 Change = .034, F Change = 4.127, Sig. F Change = .045). See Table 22.

Results of simple slope follow-up analyses dissecting the significant 2-way interaction (Adolescent Executive Functioning X Parent Executive Functioning) indicated that adolescent executive functioning was negatively related to HbA1c only when parents also endorse higher executive functioning. For families where the parent endorses lower executive functioning, adolescent executive functioning was not significantly related to HbA1c. Adolescents with higher executive functioning had better metabolic control (lower HbA1c). See Figure 6 for graphical representation.

7. *Both parent and adolescent depressive symptoms moderate the relationship between parent/adolescent health beliefs and adherence, frequency of blood glucose monitoring, and metabolic control, respectively, when controlling for gender, age, ethnicity, and family income.*

Self-report of adherence: Hierarchical multiple regression was used to test the parent/adolescent depressive symptoms moderation model proposed. Findings

indicated that the final step in the analysis was not statistically significant using an adjusted p-value of .017 (R = .858, R^2 = .737, F (18, 110) = 1.814, *p* = .032, R^2 Change = .040, F Change = .392, Sig. F Change = .878). See Table 23.

Frequency of blood glucose monitoring: Hierarchical multiple regression results were not significant for the proposed parent/adolescent depression moderation using an adjusted p-value of .05 (R = .859, R^2 = .739, F (18, 96) = .577, p = .609). The final step of the analysis including all interaction terms was not found to account for significantly more variance than pervious steps of the analysis (R^2 Change = .036, F Change = .757, Sig. F Change = .609). Further, none of the proposed 3-way interactions investigated significantly predicted the outcome variable of frequency of blood glucose monitoring (Adolescent Health Beliefs X Parent Health Beliefs X Parent Depressive Symptoms, Adolescent Health Beliefs X Parent Health Beliefs X Adolescent Depressive Symptoms, Parent Health Beliefs X Parent Depressive Symptoms X Adolescent Depressive Symptoms, Adolescent Health Beliefs X Adolescent Depressive Symptoms X Parent Depressive Symptoms). See Table 24.

HbA1c: Hierarchical multiple regression results were not significant when testing the adolescent/depression moderation model with the outcome variable of HbA1c using an adjusted p-value of .025 (F (18,110) = 1.727, *p* = .048, R = .574, R^2 = .329, R^2 Change = .000, F Change = .037, Sig. F Change = .848). See Table 25.

Discussion

The Health Belief Model (HBM) has been used across many adult and child/adolescent populations both to predict preventative health care actions and adherence to medical regimens in acute and chronic conditions (e.g. Reiter, Brewer, Gottlieb, McRee, & Smith, 2009; McQuaid, Kopel, Klein, & Fritz, 2003). Literature on the HBM in children/adolescents diagnosed with type 1 diabetes is sparse and results have been inconsistent (e.g. Bond, Aiken, & Somerville, 1992; Brownlee-Duffeck et al., 1987). These inconsistencies could exist for a number of methodological reasons such as inclusion of the Cues of Adherence factor of the theoretical model despite evidence that the construct was not measured in a reliable and valid manner or only including adolescent beliefs and not parent beliefs in the models investigated (e.g. Brownlee-Duffeck et al., 1987; Patino et al., 2005). The current study was able to address some of these possible reasons for inconsistencies by investigating a model that included only the reliable and valid factors of the HBM, included both parent and adolescent health beliefs, and sought to identify possible variables that moderate the relationship between cognition and adherence.

Summary of Results

Adolescent Health Belief Model. Current results investigating the relationship between the health belief model (HBM) and adherence/metabolic control in adolescents with type 1 diabetes did not support a relationship between either of the health belief composites used (Cost-Benefit and Severity Susceptibility) and any of the outcome variables used (Adherence, frequency blood glucose monitoring, HbA1c). However, the model including covariates (ethnicity, income, age, gender) was found to be significant as

a whole due to both age and ethnicity accounting for significant variance in adherence (SCI). Results indicated that being younger and identifying as Caucasian was related to better self-reported adherence.

Parent health belief model. Findings on the relationship between parent health beliefs and adherence indicated that the main effect of Parent Severity Susceptibility was significantly related to adherence. Additionally, the covariates of age and ethnicity were significantly related to both adherence and metabolic control. However, the model was not a significant predictor of average checks.

Parent and Adolescent HBM. Results of the combined parent and adolescent HBM indicated no relationship between the model and average blood glucose checks. While the combined model was found to be significant in predicting adherence further evaluation only indicated the covariate of Age was a significant predictor. Results indicated that lower parent severity susceptibility beliefs, identifying as Caucasian, and being younger was significantly related to lower HbA1c/better metabolic control.

Parent Responsibility as a Moderator. Results of the hierarchical regression analysis investigating the moderating effect of parent degree of responsibility on the relationship between parent and adolescent HBM and adherence/metabolic control did not indicate that parent responsibility is a moderator. However, in analyses with metabolic control as the outcome, the covariate of ethnicity and the main effect of Parent Severity Susceptibility were found to be significant.

Parent Emotional Support as a Moderator. Results did not support the hypothesis that parent emotional support for diabetes moderates the relationship between parent and adolescent HBM and adherence/metabolic control. However, the main effect of parent

emotional support on adolescent report of adherence was found to be significant. When looking at the outcome variable of metabolic control, the covariate of ethnicity and the main effect of Parent Severity Susceptibility were found to be significant.

Executive Functioning as a Moderator. None of the variables investigated in the hierarchical multiple regressions with adherence and BG monitoring as outcome variables were significant. When looking at analyses with metabolic control as the outcome, the main effects of Parent Executive Functioning, Parent Severity Susceptibility, the two-way interaction of Parent Executive Functioning X Adolescent Executive Functioning, and the three-way interaction of Parent Cost Benefit X Parent Severity Susceptibility X Adolescent Severity Susceptibility were significant. When examined outside of the larger analysis, the only remaining interaction found to be significant was Parent Executive Functioning X Adolescent Executive Functioning. Follow-up simple slope analysis showed that adolescent executive functioning was inversely related to metabolic control but only when parent executive functioning was higher.

Depression as a Moderator. Analyses looking at depression as a moderator with adherence, BG monitoring as outcome variables, and HbA1c, respectively, were not significant.

While most of the models investigated in the current study were not consistent with hypotheses there were a number of themes identified across the various findings. These themes will be identified and discussed below, followed by the clinical implications and limitations of the current study.

Themes

*Variations in Outcome Variable*s. Across each of the proposed models, independent variables had varying relationships with outcome variables. The outcome variables in the current study included adolescent self-report of adherence, frequency of blood glucose monitoring, and metabolic control (HbA1c). These outcome variables were shown to only have moderate correlations to one another. Therefore, it is not surprising that significant relationships across the study analyses/models did not hold across outcome variables. It is not unusual for the relationships between subjective measures of adherence and objective measures of metabolic control to vary. For example, the relationship between the SCI (the adolescent self-report measure used in the current study) and HbA1c has been shown to be relatively weak in previous studies (Ingerski et al., 2010; Hood, Peterson, Rohan, & Drotar, 2009). It was proposed by Hood, Peterson, Rohan, & Drotar (2009) that these discrepancies exist because self-report questionnaires of adherence measure an individual's deviation from a specific standardized medical regimen. Even if reported accurately, self-report of an individual's deviation from a standard plan may not be the most accurate way to measure adherence because diabetes management requires a patient to have a broader understanding of the disease and advanced problem solving skills, as blood glucose can be easily influenced by environmental and biological conditions (e.g. hormones, diet, exercise, stress) that make proper disease management more complex than following standardized recommendations. This may be particularly true for adolescents who are in the midst of hormonal changes that have inconsistent and not completely understood influences on blood sugar (Hood, Peterson, Rohan, & Drotar, 2009).

Frequency of blood glucose monitoring based on the adolescent's blood glucose meter download is an arguably more objective adherence measure than self-report and is commonly used as a proxy for adherence in pediatric psychology literature (e.g. Holmes et al., 2006). However, across the multiple models examined in the current study, frequency of blood glucose monitoring was not found to be related to model variables. The lack of findings with this outcome variable could be because this data was only available for 98 of the participants (compared to 112 for the other outcomes). Further, the group for which this data was available likely represents a self-selecting group because they are the individuals that remembered to bring their blood glucose meters to their endocrinology visit. Frequency of blood glucose monitoring may also be flawed as a representation of adherence behaviors because it is possible for an individual to check their blood glucose but not respond to the information appropriately (e.g. correct high blood glucose with insulin). Another reason for variations in outcome variables could be that HbA1c represents an adolescents blood glucose control over the past 8-12 weeks while frequency of blood glucose monitoring covered a span of approximately 30 days and self-report instructions prompt responses referencing the past 1-2 months and adherence habits could fluctuate between these times as could other determinants of metabolic control (e.g. prescribed insulin regimen, hormone changes). It is important to note that most of the significant findings in the current study were found using the outcome variable of HbA1c which is the most objective, gold-standard, measure of blood glucose control. While it is generally expected that better adherence will ultimately correlate to better metabolic control and better health outcomes more generally, it is important to note that among the best measures of health for an individual with diabetes

is HbA1c and findings that health beliefs could influence this health outcome speaks to the importance such cognitions have and suggests important future directions for research/intervention.

Race/Ethnicity. One of the most consistent findings in the current study was the strong relationship between identifying as Caucasian and reporting better adherence, monitoring BG more often, and having better metabolic control. The current study examined the relationship between identifying as Caucasian vs. a minority ethnicity with adherence/ metabolic control. Minority referred primarily to African Americans due to the limited participation of other minorities. The differences in healthcare understanding, health beliefs, and general medical adherence between the Caucasians and minorities (particularly African Americans) is well documented and appeared to be an important demographic variable in the current study (e.g. Kelley et al., 2005; Steers, Elliot, Nemiro, Ditman & Oskamp, 1996).

There has been limited research investigating the racial/ethnic differences in glycemic control but it has been speculated that the differences may be related to low levels of adherence and psychosocial variables such as stress, single parent households, diffusion of responsibility and family support for diabetes care (Delamater et al., 1999; Glasgow et al., 1991; Thompson, Auslander, & White, 2001). Several of these proposed variables that may explain differences in adherence/ health status by race are also highly intertwined with other demographic variables, specifically socioeconomic status. Interestingly, in the current study family income level, which was used as a proxy for socioeconomic status, did not show as high of a correlation with outcome variables as ethnicity. Whether this is related to the way family socioeconomic status was measured

in this study (parent report of family income) or whether it represents that something more specific about ethnicity, not just variables correlated with ethnicity, accounts for the strong ethnicity and adherence/metabolic control findings, is unclear. It is possible that there are biological differences in African Americans that affect blood glucose control. It is unclear what these differences may be but there is evidence that suggest African American's and Caucasians may have different psychophysiological mechanisms that effect disease process. For example, the age of onset for type 1 diabetes in African Americans is almost 2 years older than that of Caucasians which could support the theory of differences in disease process (Harlan & Grillo, 1984).

Age. Age was also found to be a covariate that accounted for a significant amount of variance in adherence/metabolic control across the models evaluated. The relationship between age and adherence/metabolic control is well documented (e.g. Wagner et al., 2005). As children get older they tend to become less adherent to their medical regimen. The strong relationship between age and adherence/metabolic control may have masked other meaningful results across models. This is supported by the correlations that existed between health beliefs, particularly adolescent health belief composites and outcome variables when not taking covariates into account. Age may also represent an important moderator that was not assessed in the current models. The age range in the current study was quite large (12 to 17). The understanding that a 12-year-old and a 17-year-old have of diabetes and their perception of the inconvenience of caring for their diabetes, particularly as they begin planning to take care of diabetes on their own, may be quite different and it is possible that breaking up the age range in the study could offer results more consistent with hypotheses, likely with the relationships between health beliefs and

adherence/metabolic control being more consistent with previous HBM research for older adolescents.

Parent Severity Susceptibility. Findings of the Parent HBM and the Parent and Adolescent HBM indicated that parent health beliefs related to parent severity susceptibility to illness are significantly related to adherence/metabolic control. These results were consistent with hypotheses and previous results showing that parent perceived susceptibility and severity of diabetes complications accounted for significant variance in metabolic control (Bond, Aiken, & Somerville, 1992). The adult diabetes literature has also found that severity and susceptibility account for the most variance when looking at the HBM and adherence/metabolic control (Jalilian, Matlagh, Solhi, & Gharibnavaz, 2014; Agha, Eftekhar, & Mohammad, 2005). However, in adult populations higher severity and susceptibility has been related to better adherence while in pediatric samples parent's beliefs related to higher severity and susceptibility of disease complications has been related to worse adherence behaviors and metabolic control (e.g. Bond, Aiken, & Somerville, 1992 ; Agha, Eftekhar, & Mohammad, 2005). Consistent with other parent health belief studies, current findings support a positive relationship between parent Severity Susceptibility and HbA1c indicating that parents who perceive their adolescent as being at higher risk are more likely to have adolescents with higher HbA1c. This relationship could exist because Parents' desire to directly intervene due to these high severity and susceptibility beliefs could result in poorer metabolic control because it results in parent-adolescent conflict, which has been associated with worse adherence and metabolic control (e.g. Wysocki, 1993). Additionally, this finding could also be representing that parents with adolescents who

have poor metabolic control are aware that their children are, in fact, at higher risk of severe complications and therefore respond more strongly to questions related to perceived susceptibility and severity.

Additionally, current findings suggesting that higher parent perceived severity and susceptibility may be problematic are also generally in line with a theory proposed by Leventhal (1970). This theory proposed that individuals who believe they are highly susceptible to illness/illness complications can be motivated to engage in fear control behaviors (e.g. avoidance; stress responses) to alleviate negative emotions related to these feelings of threat instead of responding in a way to reduce the threat (referred to by Leventhal (1970) as danger control). Therefore, in some individuals fear control and danger control compete with each other as motivating factors and can lead to less compliant health behaviors in response to high perceived illness severity/susceptibility. When taking this theory into account it could be interpreted that parent's perceived severity/susceptibility is related to higher HbA1c because they view diabetes as very dangerous and their child's chances of poor outcome as very high and therefore engage in more fear control behaviors that negatively impact their child's HbA1c.

Moderators

Parent Responsibility. Contrary to hypothesis, parent degree of responsibility for diabetes management was not found to moderate relationships between the parent/adolescent HBM and adherence and metabolic control. Parent responsibility was also not found to be correlated with other study variables. It is unclear why these relationships were not found in the current study. However, it could be related to how the DFRQ was scored and interpreted. There is evidence that using a difference score

between parent and adolescent perception of parent responsibility is an informative use of the DFRQ (Anderson et al., 2009), therefore, a difference score between parent and adolescent perception may be important to examine in future models.

Parent Emotional Support. Adolescent perception of emotional support for diabetes care demonstrated a strong and negative correlation with adolescent cost-benefit beliefs and severity susceptibility beliefs and a strong and positive correlation with self-reported adherence. Meaning that adolescents who perceived their parents as more emotionally supportive were more likely view diabetes management as having more benefits than costs and reporting better adherence. Further, the main effect of parent emotional support for diabetes care was found to be a significant predictor of self-reported adherence in the parent emotional support, parent/adolescent health beliefs, and self-reported adherence moderation model. This is consistent with previous literature emphasizing the importance of adolescent's perceiving their parents as emotionally supportive of their diabetes diagnosis and diabetes care (Lewin et al., 2006). These results also support the necessity to assess and attempt to foster parent expressions of emotional understanding of the difficulty of diabetes management.

However, findings did not support the hypothesis that parent emotional support for diabetes care moderates the relationship between parent/adolescent health beliefs and self-report of adherence, HbA1c, or frequency of blood glucose monitoring. This may be because parent emotional support was significantly correlated with both the predictors and the outcomes of the proposed model. Instead of level of emotional support impacting how cognitions relate to adherence, individuals with specific cognitions (e.g. lower Cost-Benefit) may simply be more likely to be in families with higher emotional support for

diabetes. It could be that the cumulative effect of lower perceived cost, severity, and susceptibility and higher parent emotional support for diabetes together predict outcomes meaning moderation analyses would not yield significant results.

Executive Functioning. Much of the recent literature on diabetes adherence and executive functioning has focused only on child/adolescent executive functioning (e.g. Northam et al., 2001; McNally, Rohan, Pendley, & Delamater, 2010). One aim of the current study was to better understand the possible relationship and interaction between parent executive functioning and adolescent executive functioning as well as the moderating effect of these abilities on the relationship between parent/adolescent cognitions and adherence/metabolic control. As predicted, results indicated that both higher parent and adolescent executive functioning were significantly correlated with better adherence/metabolic control. Additionally, executive functioning results also indicated that adolescent disease-specific executive functioning was related to metabolic control only when parents had higher executive functioning skills, which may be related to the important role parent modeling has on adolescent disease management (Streisand, Swift, Wickmark, Chen, & Holmes, 2005). However, this relationship may also illustrate that adolescents with parents that have higher executive functioning have more internal and external resources to use for management. Further, results support the importance of executive functioning abilities in properly managing diabetes.

Depression. Neither parent nor adolescent depressive symptoms moderated the relationship between health beliefs and adherence/metabolic control. The lack of support for the proposed model may be a reflection of the known correlates of depression which make engaging in adherence behaviors more difficult regardless of an individual's health

beliefs. These correlates include low motivation, difficulty problem solving, and decreased self-efficacy (e.g. Stewart et al., 2005, Johnson, Eiser, Young, Bierley, & Heller, 2013). It is possible that these byproducts of depression make taking action when necessary for disease management difficult but that they don't affect the individual's overarching beliefs about diabetes. This possibility is supported by the strong and negative bivariate correlations parent depression showed with parent emotional support and parent executive functioning in the current study.

Depressive symptoms were not related to the frequency of blood glucose monitoring or HbA1c outcomes. There were lower rates of depressive symptoms endorsed by both parents and adolescents in the current study than would be expected. The increased rate of depressive symptoms in adolescents diagnosed with type 1 diabetes is well documented (Wiebe et al., 2011; LaGreca, Swales, Klemp, Madigan, & Skyler, 1995). The CDI was used in the current study to measure depressive symptoms. This measure has been used previously in samples of adolescents with type 1 diabetes. Hood et al. (2006) reported that 15% of adolescents (age 10 – 18) diagnosed with type 1 diabetes scored higher than the published cut off on the CDI. In the current sample 12% of the sample endorsed CDI scores above the cut off. This variation in scores likely did not have a significant influence on results; however, a more dramatic difference was found for parent depressive symptoms. The mean DASS-21 depressive scores recently published in a non-clinical sample is 5.5 (Henry & Crawford, 2005). In the current study the mean for parents on the DASS-21 was much lower at 1.37. However, the difference in these scores needs to be interpreted within the context of the prescribed DASS-21 cut-off scores which indicate that a "normal" score falls between 0 and 9. That being said, the

lower rate of depressive symptoms in the current sample may be a reflection of the parents that agreed to participate in the study. Parents with higher depressive symptoms may have been less likely to agree to participate when asked or less likely to make and keep their appointments in general. The limited range in parent depression scores could have influenced analyses, making it more difficult to detect significant results.

Clinical implications

Findings of the parent and adolescent health belief model in the current study highlights the importance of parent's beliefs even as children get older and take on more responsibility for disease management. Therefore, identification of and further evaluation of parental cognitions in clinical settings may be important. Clinically, adolescent cognitions are likely assessed much more often than parent cognitions and current results suggest that a parent's view of diabetes as being a severe disease and their child being highly susceptible to diabetes complications may have negative implications for adolescents adherence. Typically, when parents express understanding of the serious nature of diabetes and its complications in clinical settings it is interpreted as a positive or protective factor. However, current results indicate this might not always be the case. Being aware of and understanding the possible negative implications of these beliefs is important for healthcare providers and psychologists working with this population.

Current results also emphasize the role psychologists can play in improving metabolic control by identifying families with executive functioning difficulties and helping them to learn how to use external supports or capitalize on their strengths to overcome their executive functioning weaknesses and accomplish disease management tasks. Identifying executive functioning weaknesses may be particularly important in

adolescent patients as current results support previous findings that adolescent executive functioning accounts for a significant amount of variance in adolescent-report of adherence (Rohan, Pendley, & Delamater, 2010). Further, children/adolescents are still developing their prefrontal cortex, which is the part of the brain most implicated in coordinating executive abilities. Therefore, difficulties with advanced executive functioning are likely a common barrier for adolescents with type 1 diabetes. Not only does the adolescent need to plan and organize adherence behaviors but when applying these abilities to diabetes they may also be making these decisions in the context of significant stress and strong emotions (Duke & Harris, 2014). It is known that regulating emotions and stress can interfere with effective implementation of executive functioning abilities, which could play a role in both parent and adolescent adherence behaviors (e.g. Bull & Scerif, 2001). Duke & Harris (2014) suggested that diabetes management can often elicit stress and sometimes negative emotions for adolescents; therefore, the negative impact of emotions/stress on implementation of executive functioning abilities also supports the need to understand an adolescent's executive functioning abilities as they apply particularly to diabetes care.

Limitations

The current study extended the literature by examining possible moderators of the HBM in predicting adolescent adherence/HbA1c. However, there are a number of limitations that should be acknowledged. One of the primary limitations of the current study was the sample size. The number of participants in the current study was lower than planned prior to the study beginning and has resulted in lower power than would be desirable for detecting significant relationships, particularly in the larger/more complex

regression analyses (i.e. interactions involving executive functioning and depression). A related concern is that significant covariates may mask important relationships in the data because of the relatively low power. Age and ethnicity, in particular, accounted for a relatively large portion of variance in several of the proposed models (e.g. Adolescent and Parent Health Beliefs Model, Parent Responsibility Moderation Model). Age was also a strong predictor in some models which may be a results of the wide age range used in the current study. The age range of 12 to 17 represents a large variation in developmental level and amount of autonomy for diabetes care.

The generalizability of current findings is limited by the demographic makeup of the participants as well. Participants were all recruited in northeast Ohio and attended a hospital-affiliated endocrine clinic. Families that get care from a large academic medical setting may be different from those that get diabetes care elsewhere. For instance, they may be more highly educated or have more severe or complex diabetes which lead them to seek a university affiliated hospital for their care. The majority of those approached for participation in the study agreed to participate, however, those that declined may share characteristics with those that miss their scheduled appointments or do not regularly follow-up with their endocrinologist limiting generalizability to those that schedule and keep their appointments and/or those inclined to participate in the research study. The majority of participants in this sample identified as Caucasians or African American/Blacks with only 7% of the sample identifying as Mixed, Asian/Asian American, Hispanic/Latino, or Other, limiting the generalizability of findings to certain populations (most notably Asian and Hispanic populations). Investigating the HBM in Asian and Hispanic populations, respectively, will be important as differences have been

noted not only in the characteristics of family relations but also in general health care perception and understanding in these populations (e.g. George, Duran, & Norris, 2014; Moore et al., 2013). Participants also represent individuals that attended their scheduled appointment and agreed to participate which both represent a self-selecting group of individuals that have the internal and external resources to get to their appointment and the motivation to complete study questionnaires. Relatedly, parent depressive symptoms were notably lower in the current sample than would be expected based on previous research (Henry & Crawford, 2005). The problem of restriction of parent depressive symptoms could also have limited power to find important interactions. It is possible that families who do not present for follow-up appointment for diabetes care or those that choose not to participate in the study may had less psychological distress.

Although the measure for adolescent executive functioning related to diabetes has been shown to be reliable and valid (Duke & Harris, 2014), only three of the subtests were used in the current study in order to minimize participant burden. These subtests (planning, inhibit, and sequential task completion) have shown appropriate reliability and validity individually but not as a composite as they were used in the current study. Adolescent and parent executive functioning were investigated in the same model; however, adolescent executive functioning measured was disease specific while parent executive functioning was measured using a broad measure of executive functioning

Future Directions

Findings of the current study suggest a number of future directions. Further evaluation of some of the moderation models with larger samples is warranted. As previously discussed, age and ethnicity were significant covariates across multiple

models investigated in the current study and were strongly correlated with adherence/metabolic control. Future studies may investigate how relationships between health beliefs and adherence/metabolic control vary based on age of adolescent and ethnicity. The importance of parent and adolescent cognitions may vary depending on adolescent age/developmental level or by ethnicity. Additional research is also needed better understand the link between parent/adolescent executive functioning, parent/adolescent health beliefs, and adherence/metabolic control, as current results offer preliminary data suggesting these relationships may be important and deserve further attention. For example, researchers may wish to investigate the health belief, executive functioning, and adherence relationship using both parent and adolescent diabetes specific executive functioning measures, should a parent specific measure be found reliable and valid for this population.

The current study is cross-sectional in nature and casual statements regarding findings cannot be made and thus replication utilizing a longitudinal design is needed. Additionally, research investigating health beliefs and long-term disease management could help to better identify health belief targets for intervention. Investigation of proposed moderators over time will also be important as a way to study effects of targeted intervention on changing health beliefs. The utility of the HBM related to its potential ability to streamline and target psychological treatment in this population. Such interventions cannot be designed and tested without studies that aim to better understand how the variables interact over time in the type 1 diabetes population.

Once health belief targets for intervention are identified, models of intervention and prevention could be adapted from previous HBM interventions shown to be

successful in other populations. There have been successful implementations of HBM interventions in adults with type 2 diabetes. For example, Jalilian, Matlagh, Solhi, and Gharibnavaz (2014) identified perceived susceptibility to illness complications and perceived severity of diabetes and/or its complications as target health beliefs because they were found to be most related to adherence in their population. The authors also identified self-efficacy as a related area for targeted intervention. They implemented a 6-week program that focused on education surrounding severity of type 2 diabetes, possible diabetes complications, and the relationship between health/disease management and risk factors such as poor foot care and smoking. In addition, they had activities and guided examples of problem solving and active diabetes care to improve self-efficacy. By targeting the areas that were more highly related to adherence in their population they were able to create a successful pilot program that helped adults successfully manage type 2 diabetes. This type of targeted intervention should be considered for families of children with type 1 diabetes as well. However, content identified as important in such an intervention would likely look much different than the intervention previously described as parent perceptions of severity and susceptibility were associated with worse metabolic control in the current study. Longitudinal research will help to better identify the direction of this relationship but a focus on identifying barriers to adherence may be most helpful if assessment and intervention also focus on symptoms of depression and executive functioning deficits. A focus on teaching strategies for overcoming executive functioning difficulties and supporting families in problem solving around these difficulties may be a particularly important part of a cognitive family intervention aimed at improving adolescent adherence/HbA1c. Before such a program can effectively be

implements, the important parent and teen beliefs and potential moderating variables need to be fully explored. For instance, current results suggest that while targeting parent and adolescent's abilities to plan and organize, parents may benefit from targeting cognitions related to perceived severity and susceptibility of diabetes complications. Parents may also benefit from learning strategies for appropriately managing such cognitions and supporting their adolescent effectively both practically and emotionally. Overall, the current findings support the need for continued research on improving the assessment of parent and adolescent psychological functioning and cognitions and the implementation of targeted and efficacious treatments.

Table 1.
Descriptive Statistics of Study Variables

Construct (measure)	Mean	SD	Range
Adolescent Age	14.69	1.547	12 – 17
Self-Care Inventory- Revised (SCI-R)	55.75	8.4	31 - 75
Frequency of blood glucose monitoring	4.64	2.602	1-14
HbA1	8.99	1.699	6 – 14
Parent Cost-Benefit (DHBQ-P)	-3.197	5.650	-13 – 20
Parent Severity and Susceptibility (DHBQ-P)	20.419	3.630	14 – 35
Adolescent Cost-Benefit (DHBQ)	-1.720	6.435	-13 – 22
Adolescent Severity and Susceptibility (DHBQ)	20.80	4.123	14 - 37
Parent Executive Functioning (BDEFS)	26.186	6.048	20 – 60
Adolescent Executive Functioning (DREFS-P)	81.202	11.631	34 – 101
Parent Depression (DASS depression subscale)	2.740	4.534	0 – 24
Adolescent Depression (CDI)	27.522	4.764	22 – 43
Parent Warmth and Caring (DFBS warmth and caring)	54.632	8.267	30 – 71
Parent Responsibility (DFRQ Adolescent report)	31.550	3.993	22 – 41

Table. 2
Pearson-Product Correlations of Study Variables

	Ethnicity	Income	Age	Gender	Monitor	HbA1c	Adhere	Par CB	Par SS	Teen CB	Teen SS	Par EF	Teen EF	Par Dep	Teen Dep	Par Emot	Par Resp
Ethnicity	1	.225*	-.082	-.089	-.123	-.336**	.341**	-.257*	.132	-.240*	-.191	.087	-.042	.064	.037	.077	.023
Income	.225*	1	.131	.112	-.180	-.288**	.094	-.022	-.050	-.270**	-.170	-.125	-.036	-.057	.063	.056	-.156
Age	-.082	.131	1	.132	-.088	-.133	-.296**	.110	.137	-.070	.041	.011	-.110	.102	.073	.028	-.401**
Gender	-.089	.112	.132	1	-.080	-.007	-.174	.041	-.026	-.057	.101	-.093	-.031	-.110	.170	-.198*	-.162
BG Monitor	-.123	-.180	-.088	-.080	1	.693**	-.375**	.139	.191	.164	.019	-.119	-.264*	-.063	.081	-.158	.056
HbA1c	-.336**	-.288**	-.133	-.007	.693**	1	-.232*	.178	.251*	.304**	.234*	-.086	-.235*	-.104	.117	-.154	.170
Adherence	.341**	.094	-.296**	-.174	-.375**	-.232*	1	-.297**	-.167	-.289**	-.281**	-.089	.311**	-.089	-.215*	.408**	.270**
Par CB	-.257*	-.022	.110	.041	.139	.178	-.297**	1	.343**	.279**	.217*	.256*	-.253*	.135	.138	-.217*	-.014
Par SS	.132	-.050	.137	-.026	.191	.251*	-.167	.343**	1	.206*	.169	.215*	-.398**	.378**	.233*	-.214*	.005
Teen CB	-.240*	-.270**	-.070	-.057	.164	.304**	-.289**	.279**	.206*	1	.513**	.139	-.262**	.068	.218*	-.382**	.100
Teen SS	-.191	-.170	.041	.101	.019	.234*	-.281**	.217*	.169	.513**	1	.087	-.241*	.072	.368**	-.417**	.094
Par EF	.087	-.125	.011	-.093	-.119	-.086	-.089	.256*	.215*	.139	.087	1	-.146	.569**	.021	-.073	.021
Teen EF	-.042	-.036	-.110	-.031	-.264*	-.235*	.311**	-.253*	-.398**	-.262**	-.241*	-.146	1	-.069	-.253*	.189	.078
Par Dep	.064	-.057	.102	-.110	-.063	-.104	-.089	.135	.378**	.068	.072	.569**	-.069	1	.277**	-.215*	-.119
Teen Dep	.037	.063	.073	.170	.081	.117	-.215*	.138	.233*	.218*	.368**	.021	-.253*	.277**	1	-.410**	.132
Par Emot	.077	.056	.028	-.198*	-.158	-.154	.408**	-.217*	-.214*	-.382**	-.417**	-.073	.189	-.215*	-.410**	1	.100
Par Resp	.023	-.156	-.401**	-.162	.056	.170	.270**	-.014	.005	.100	.094	.021	.078	-.119	.132	.100	1

* $p < .05$, ** $p < .01$
Teen CB = Teen Cost-Benefit
Teen SS = Teen Severity Susceptibility
Par CB = Parent Cost-Benefit
Par SS = Parent Severity Susceptibility
Adhere = Teen report of adherence (SCI-R)
BG Monitor = Frequency of blood glucose monitoring
Par EF = Parent executive Functioning
Par Dep = Parent depression
Par Emot = Parent emotional support
Teen Dep = Teen depression
Teen EF = Teen executive functioning
Par Resp = Parent responsibility

Table 3.
Regression Results for Adolescent Health Beliefs Model Predicting Adherence (SCI scores)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	66.206	8.456		7.830	0.000
	Ethnicity	2.018	0.650	0.289	3.103*	0.002
	Income	0.450	0.600	0.070	0.749	0.456
	Age	-1.389	0.497	-0.255	-2.793*	0.006
	Gender	-1.983	1.530	-0.118	-1.296	0.198
2	(Constant)	70.084	8.357		8.387	0.000
	Ethnicity	1.636	0.643	0.234	2.545*	0.012
	Income	0.076	0.595	0.012	0.127	0.899
	Age	-1.423	0.483	-0.262	-2.946	0.004
	Gender	-1.944	1.497	-0.116	-1.299	0.197
	Adolescent Cost-Benefit	-1.669	0.891	-0.197	-1.874	0.064
	Adolescent Severity Susceptibility	-0.941	0.869	-0.111	-1.083	0.281

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	6.083*	0.000	0.442	0.196	0.196	6.083*	0.000
Model 2	5.792	0.000	0.512	0.262	0.217	4.386*	0.015

* indicates significance at $p < .017$ (p derived using Holm-Bonferroni)

Table 4.
Regression Results for Adolescent Health Beliefs Model Predicting Frequency of Blood Glucose Monitoring

		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.917	2.752		2.513	0.014
	Ethnicity	-0.020	0.212	-0.010	-0.096	0.924
	Income	0.245	0.195	0.129	1.252	0.214
	Age	-0.230	0.162	-0.142	-1.419	0.159
	Gender	0.254	0.498	0.051	0.511	0.611
2	(Constant)	8.229	2.761		2.981	0.004
	Ethnicity	-0.114	0.212	-0.055	-0.537	0.593
	Income	0.152	0.197	0.080	0.775	0.440
	Age	-0.254	0.160	-0.157	-1.589	0.115
	Gender	0.177	0.494	0.036	0.357	0.722
	Adolescent Cost-Benefit	-0.655	0.294	-0.261	-2.225	0.028
	Adolescent Severity Susceptibility	0.106	0.287	0.042	0.368	0.713

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	0.874	0.482	0.184	0.034	0.034	0.874	0.482
Model 2	1.543	0.172	0.294	0.086	0.053	2.817	0.065

* indicates significance at $p < .025$ (p derived using Holm-Bonferroni)

Table 5.
Regression Results for Adolescent Health Beliefs Model Predicting Metabolic Control (HbA1c)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	14.135	1.728		8.182	0.000
	Ethnicity	-0.392	0.133	-0.280	-2.948*	0.004
	Income	-0.255	0.123	-0.199	-2.082*	0.040
	Age	-0.143	0.102	-0.131	-1.407	0.163
	Gender	0.026	0.313	0.008	0.084	0.933
2	(Constant)	13.546	1.740		7.784	0.000
	Ethnicity	-0.333	0.134	-0.238	-2.489*	0.015
	Income	-0.198	0.124	-0.154	-1.598	0.113
	Age	-0.138	0.101	-0.127	-1.371	0.173
	Gender	0.019	0.312	0.006	0.061	0.952
	Adolescent Cost-Benefit	0.252	0.185	0.149	1.361	0.177
	Adolescent Severity Susceptibility	0.150	0.181	0.089	0.828	0.409

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.805*	0.001	0.402	0.161	0.161	4.805*	0.001
Model 2	4.090*	0.001	0.448	0.200	0.039	2.393	0.097

* indicates significance at $p < .05$ (p derived using Holm-Bonferroni)

Table 6.
Regression Results for Parent Health Beliefs Model Predicting Adherence (SCI)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	66.206	8.456		7.830	0.000
	Ethnicity	2.018	0.650	0.289	3.103*	0.002
	Income	0.450	0.600	0.070	0.749	0.456
	Age	-1.389	0.497	-0.255	-2.793*	0.006
	Gender	-1.983	1.530	-0.118	-1.296	0.198
2	(Constant)	69.555	8.842		7.867	0.000
	Ethnicity	1.868	0.681	0.267	2.744*	0.007
	Income	0.398	0.592	0.062	0.673	0.503
	Age	-1.215	0.493	-0.223	-2.466*	0.015
	Gender	-2.014	1.497	-0.120	-1.345	0.182
	Parent Cost-Benefit	-0.237	0.148	-0.158	-1.599	0.113
	Parent Severity Susceptibility	-0.273	0.227	-0.117	-1.203	0.232

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	6.083*	0.000	0.442	0.196	0.196	6.083*	0.000
Model 2	5.320*	0.000	0.496	0.246	0.050	3.246	0.043

* indicates significance at $p < .017$ (p derived using Holm-Bonferroni)

Table 7.
Regression Results for Parent Health Beliefs Model Predicting Frequency of Blood Glucose Monitoring

		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.917	2.752		2.513	0.014
	Ethnicity	-0.020	0.212	-0.010	-0.096	0.924
	Income	0.245	0.195	0.129	1.252	0.214
	Age	-0.230	0.162	-0.142	-1.419	0.159
	Gender	0.254	0.498	0.051	0.511	0.611
2	(Constant)	6.204	2.807		2.210	0.029
	Ethnicity	0.023	0.226	0.011	0.104	0.918
	Income	0.216	0.197	0.114	1.101	0.274
	Age	-0.190	0.164	-0.118	-1.160	0.249
	Gender	0.239	0.497	0.048	0.480	0.632
	Parent Cost-Benefit	-0.027	0.278	-0.011	-0.098	0.922
	Parent Severity Susceptibility	-0.373	0.274	-0.148	-1.359	0.177

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	0.874	0.482	0.184	0.034	0.034	0.874	0.482
Model 2	0.970	0.450	0.237	0.056	0.022	1.157	0.319

* indicates significance at $p < .025$ (p derived using Holm-Bonferroni)

Table 8.
Regression Results for Parent Health Beliefs Model Predicting Metabolic Control (HbA1c)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	14.135	1.728		8.182	0.000
	Ethnicity	-0.392	0.133	-0.280	-2.948*	0.004
	Income	-0.255	0.123	-0.199	-2.082*	0.040
	Age	-0.143	0.102	-0.131	-1.407	0.163
	Gender	0.026	0.313	0.008	0.084	0.933
2	(Constant)	15.137	1.685		8.986	0.000
	Ethnicity	-0.460	0.136	-0.329	-3.387*	0.001
	Income	-0.216	0.118	-0.168	-1.828	0.071
	Age	-0.196	0.098	-0.181	-2.000*	0.048
	Gender	0.048	0.298	0.014	0.162	0.871
	Parent Cost-Benefit	0.005	0.167	0.003	0.030	0.976
	Parent Severity Susceptibility	0.518	0.164	0.306	3.147*	0.002

		F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.805*	0.001	0.402	0.161	0.161	4.805*	0.001	
Model 2	5.477*	0.000	0.501	0.251	0.090	5.884*	0.004	

* indicates significance at $p < .05$ (p derived using Holm-Bonferroni)

Table 9.
Regression Results for Parent and Adolescent Health Beliefs Model Predicting Adherence (SCI)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	66.206	8.456		7.830	0.000
	Ethnicity	2.018	0.650	0.289	3.103*	0.002
	Income	0.450	0.600	0.070	0.749	0.456
	Age	-1.389	0.497	-0.255	-2.793*	0.006
	Gender	-1.983	1.530	-0.118	-1.296	0.198
2	(Constant)	68.331	8.535		8.006	0.000
	Ethnicity	1.588	0.681	0.227	2.333	0.022
	Income	0.116	0.596	0.018	0.194	0.846
	Age	-1.293	0.488	-0.238	-2.650*	0.009
	Gender	-1.959	1.489	-0.117	-1.316	0.191
	Parent Cost-Benefit	-0.994	0.837	-0.118	-1.187	0.238
	Parent Severity Susceptibility	-0.662	0.824	-0.078	-0.803	0.424
	Adolescent Cost-Benefit	-1.311	0.909	-0.155	-1.443	0.152
	Adolescent Severity Susceptibility	-0.806	0.868	-0.095	-0.929	0.355

		F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	6.083*	0.000	0.442	0.196	0.196	6.083*	0.000	
Model 2	4.777*	0.000	0.534	0.285	0.089	2.988	0.023	

* indicates significance at $p < .017$ (p derived using Holm-Bonferroni)

Table 10.
Regression Results for Parent and Adolescent Health Beliefs Model Predicting Frequency of Blood Glucose Monitoring

		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.917	2.752		2.513*	0.014
	Ethnicity	-0.020	0.212	-0.010	-0.096	0.924
	Income	0.245	0.195	0.129	1.252	0.214
	Age	-0.230	0.162	-0.142	-1.419	0.159
	Gender	0.254	0.498	0.051	0.511	0.611
2	(Constant)	7.546	2.848		2.649*	0.009
	Ethnicity	-0.051	0.227	-0.025	-0.226	0.821
	Income	0.138	0.199	0.073	0.697	0.488
	Age	-0.227	0.163	-0.140	-1.392	0.167
	Gender	0.163	0.497	0.033	0.329	0.743
	Parent Cost-Benefit	0.068	0.279	0.027	0.244	0.808
	Parent Severity Susceptibility	-0.288	0.275	-0.115	-1.047	0.298
	Adolescent Cost-Benefit	-0.610	0.303	-0.243	-2.010	0.057
	Adolescent Severity Susceptibility	0.127	0.290	0.051	0.438	0.662

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	0.874	0.482	0.184	0.034	0.034	0.874	0.482
Model 2	1.286	0.260	0.311	0.097	0.063	1.674	0.162

* indicates significance at $p < .05$ (p derived using Holm-Bonferroni)

Table 11.
Regression Results for Parent and
Adolescent Health Beliefs Model Predicting Metabolic Control (HbA1c)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	14.135	1.728		8.182	0.000
	Ethnicity	-0.392	0.133	-0.280	-2.948*	0.004
	Income	-0.255	0.123	-0.199	-2.082	0.040
	Age	-0.143	0.102	-0.131	-1.407	0.163
	Gender	0.026	0.313	0.008	0.084	0.933
2	(Constant)	14.685	1.729		8.495	0.000
	Ethnicity	-0.424	0.138	-0.303	-3.075*	0.003
	Income	-0.180	0.121	-0.140	-1.489	0.140
	Age	-0.187	0.099	-0.172	-1.891	0.062
	Gender	0.040	0.302	0.012	0.132	0.896
	Parent Cost-Benefit	-0.039	0.170	-0.023	-0.229	0.819
	Parent Severity Susceptibility	0.475	0.167	0.281	2.847*	0.005
	Adolescent Cost-Benefit	0.162	0.184	0.096	0.880	0.381
	Adolescent Severity Susceptibility	0.110	0.176	0.065	0.623	0.535

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.805*	0.001	0.402	0.161	0.161	4.805*	0.001
Model 2	4.374*	0.000	0.517	0.267	0.106	3.468*	0.011

* indicates significance at $p < .025$ (p derived using Holm-Bonferroni)

Table 12.
Regression Results for Parent Responsibility Moderation Model Predicting Adherence (SCI)

		B	Std. Error	Beta	T	Sig.
1	(Constant)	66.206	8.456		7.830	0.000
	Ethnicity	2.018	0.650	0.289	3.103*	0.002
	Income	0.450	0.600	0.070	0.749	0.456
	Age	-1.389	0.497	-0.255	-2.793*	0.006
	Gender	-1.983	1.530	-0.118	-1.296	0.198
2	(Constant)	61.005	8.898		6.856	0.000
	Ethnicity	1.560	0.665	0.223	2.345	0.021
	Income	0.230	0.584	0.036	0.394	0.695
	Age	-0.851	0.512	-0.157	-1.662	0.100
	Gender	-1.555	1.465	-0.093	-1.062	0.291
	Parent Cost-Benefit	-0.998	0.818	-0.118	-1.220	0.225
	Parent Severity Susceptibility	-0.713	0.806	-0.084	-0.885	0.378
	Adolescent Cost-Benefit	-1.290	0.888	-0.153	-1.452	0.150
	Adolescent Severity Susceptibility	-1.011	0.853	-0.120	-1.186	0.239
	Parent Responsibility	1.869	0.792	0.220	2.361	0.020
3	(Constant)	59.572	9.108		6.541	0.000
	Ethnicity	1.524	0.661	0.218	2.304	0.023
	Income	0.270	0.583	0.042	0.463	0.645
	Age	-0.731	0.521	-0.134	-1.402	0.164
	Gender	-1.854	1.469	-0.111	-1.262	0.210
	Parent Cost-Benefit	-1.096	0.861	-0.130	-1.274	0.206
	Parent Severity Susceptibility	-0.366	0.820	-0.043	-0.447	0.656
	Adolescent Cost-Benefit	-1.553	0.891	-0.184	-1.743	0.085
	Adolescent Severity Susceptibility	-1.904	0.939	-0.225	-2.028	0.045
	Parent Responsibility	1.749	0.811	0.206	2.157	0.034
	Parent SS X Parent Responsibility	-0.406	0.895	-0.041	-0.454	0.651
	Parent CB X Parent Responsibility	-0.319	0.895	-0.037	-0.357	0.722

Adolescent SS X Parent Resp			1.243	0.988	0.174	1.257	0.212
Adolescent CB X Parent Resp			0.666	0.879	0.093	0.758	0.451
	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	6.083*	0.000	0.442	0.196	0.196	6.083*	0.000
Model 2	5.068*	0.000	0.570	0.366	0.129	3.619*	0.005
Model 3	4.033*	0.000	0.605	0.366	0.041	1.475	0.216

* indicates significance at $p < .017$ (p derived using Holm-Bonferroni)

Table 13.
Regression Results for Parent Responsibility Moderation Model Predicting Frequency of Blood Glucose Monitoring

		B	Std. Error	Beta	T	Sig.
1	(Constant)	6.978	3.096		2.254	0.027
	Ethnicity	-0.015	0.258	-0.007	-0.059	0.953
	Income	0.222	0.218	0.119	1.018	0.311
	Age	-0.218	0.183	-0.132	-1.190	0.237
	Gender	0.096	0.554	0.019	0.172	0.864
2	(Constant)	7.166	3.369		2.127	0.037
	Ethnicity	-0.084	0.282	-0.037	-0.296	0.768
	Income	0.147	0.226	0.079	0.649	0.518
	Age	-0.175	0.195	-0.105	-0.893	0.374
	Gender	-0.039	0.568	-0.008	-0.069	0.945
	Parent Cost-Benefit	0.001	0.338	0.000	0.003	0.998
	Parent Severity Susceptibility	-0.278	0.308	-0.112	-0.900	0.371
	Adolescent Cost-Benefit	-0.647	0.339	-0.259	-1.908	0.060
	Adolescent Severity Susceptibility	0.172	0.323	0.070	0.534	0.595
	Parent Responsibility	0.128	0.293	0.051	0.436	0.664
3	(Constant)	6.076	3.540		1.717	0.090
	Ethnicity	-0.065	0.289	-0.029	-0.226	0.822
	Income	0.191	0.233	0.102	0.818	0.416
	Age	-0.128	0.204	-0.077	-0.624	0.534
	Gender	0.048	0.581	0.010	0.083	0.934
	Parent Cost-Benefit	-0.039	0.354	-0.015	-0.111	0.912
	Parent Severity Susceptibility	-0.264	0.329	-0.107	-0.803	0.425
	Adolescent Cost-Benefit	-0.561	0.357	-0.224	-1.574	0.120
	Adolescent Severity Susceptibility	0.083	0.360	0.034	0.231	0.818
	Parent Responsibility	0.226	0.314	0.091	0.721	0.473
	Parent SS X Parent Responsibility	0.030	0.359	0.011	0.084	0.933
	Parent CB X Parent Responsibility	-0.218	0.353	-0.082	-0.618	0.539
	Adolescent SS X Parent Resp	0.439	0.382	0.216	1.149	0.254

Adolescent CB X Parent Resp			-0.431	0.356	-0.208	-1.210	0.230
	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	0.874	0.482	0.184	0.034	0.034	0.874	0.482
Model 2	1.143	0.341	0.313	0.098	0.064	1.346	0.252
Model 3	0.910	0.546	0.339	0.115	0.017	0.447	0.774

* indicates significance at $p < .05$ (p derived using Holm-Bonferroni)

Table 14.
Regression Results for Parent Responsibility Moderation Model Predicting Metabolic Control (HbA1c)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	14.135	1.728		8.182	0.000
	Ethnicity	-0.392	0.133	-0.280	-2.948*	0.004
	Income	-0.255	0.123	-0.199	-2.082	0.040
	Age	-0.143	0.102	-0.131	-1.407	0.163
	Gender	0.026	0.313	0.008	0.084	0.933
2	(Constant)	13.084	2.603		5.026	0.000
	Ethnicity	-0.426	0.138	-0.305	-3.084*	0.003
	Income	-0.171	0.121	-0.134	-1.414	0.161
	Age	-0.155	0.106	-0.142	-1.457	0.149
	Gender	0.069	0.304	0.021	0.227	0.821
	Parent Cost-Benefit	-0.039	0.170	-0.023	-0.231	0.818
	Parent Severity Susceptibility	0.472	0.167	0.279	2.819*	0.006
	Adolescent Cost-Benefit	0.164	0.184	0.097	0.887	0.377
	Adolescent Severity Susceptibility	0.095	0.177	0.056	0.535	0.594
	Parent Responsibility	0.034	0.041	0.080	0.824	0.412
3	(Constant)	14.483	2.713		5.338	0.000
	Ethnicity	-0.437	0.139	-0.312	-3.141*	0.002
	Income	-0.191	0.122	-0.149	-1.558	0.123
	Age	-0.198	0.110	-0.182	-1.808	0.074
	Gender	-0.004	0.309	-0.001	-0.012	0.991
	Parent Cost-Benefit	0.031	0.181	0.018	0.172	0.864
	Parent Severity Susceptibility	0.464	0.172	0.274	2.693*	0.008
	Adolescent Cost-Benefit	0.138	0.187	0.081	0.736	0.464
	Adolescent Severity Susceptibility	0.150	0.197	0.088	0.758	0.450
	Parent Responsibility	0.017	0.043	0.041	0.408	0.684
	Parent SS X Parent Responsibility	-0.196	0.188	-0.100	-1.041	0.301
	Parent CB X Parent Responsibility	0.246	0.188	0.141	1.311	0.193
	Adolescent SS X Parent Resp	-0.284	0.208	-0.199	-1.367	0.175

Adolescent CB X Parent Resp			0.218	0.185	0.153	1.180	0.241
	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.805*	0.001	0.402	0.161	0.161	4.805*	0.001
Model 2	3.950*	0.000	0.522	0.272	0.111	2.901*	0.018
Model 3	2.999*	0.001	0.548	0.300	0.028	0.899	0.468

* indicates significance at $p < .025$ (p derived using Holm-Bonferroni)

Table 15.
Regression Results for Parent Emotional Support Moderation Model Predicting Adherence (SCI)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	66.206	8.456		7.830	0.000
	Ethnicity	2.018	0.650	0.289	3.103*	0.002
	Income	0.450	0.600	0.070	0.749	0.456
	Age	-1.389	0.497	-0.255	-2.793*	0.006
	Gender	-1.983	1.530	-0.118	-1.296	0.198
2	(Constant)	67.914	8.127		8.356	0.000
	Ethnicity	1.663	0.649	0.238	2.565*	0.012
	Income	0.196	0.567	0.031	0.345	0.731
	Age	-1.415	0.466	-0.260	-3.037*	0.003
	Gender	-0.955	1.450	-0.057	-0.658	0.512
	Parent Cost-Benefit	-0.813	0.799	-0.096	-1.017	0.312
	Parent Severity Susceptibility	-0.365	0.790	-0.043	-0.463	0.645
	Adolescent Cost-Benefit	-0.693	0.885	-0.082	-0.782	0.436
	Adolescent Severity Susceptibility	-0.102	0.854	-0.012	-0.120	0.905
	Parent Emotional Support	2.711	0.821	0.318	3.303*	0.001
3	(Constant)	68.167	8.189		8.325	0.000
	Ethnicity	1.526	0.655	0.218	2.329	0.022
	Income	0.256	0.571	0.040	0.448	0.655
	Age	-1.450	0.468	-0.267	-3.100*	0.003
	Gender	-0.788	1.454	-0.047	-0.542	0.589
	Parent Cost-Benefit	-0.674	0.808	-0.080	-0.834	0.406
	Parent Severity Susceptibility	-0.380	0.797	-0.045	-0.476	0.635
	Adolescent Cost-Benefit	-0.427	0.899	-0.051	-0.476	0.635
	Adolescent Severity Susceptibility	-0.414	0.870	-0.049	-0.475	0.636
	Parent Emotional Support	3.007	0.858	0.352	3.506*	0.001
	Parent SS X Par Emotional Sup	-0.531	0.964	-0.057	-0.550	0.583
	Parent CB X Par Emotional Sup	0.160	1.061	0.014	0.151	0.880

Adol SS X Par Emotional Sup	-1.092	0.936	-0.144	-1.167	0.246
Adol CB X Par Emotional Sup	-0.084	0.901	-0.010	-0.093	0.926

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	6.083*	0.000	.442	0.196	0.196	6.083*	0.000
Model 2	5.898*	0.000	.599	0.358	0.163	4.820*	0.001
Model 3	4.443*	0.000	.623	0.388	0.030	1.110	0.357

* indicates significance at $p < .017$ (p derived using Holm-Bonferroni)

Table 16.
Regression Results for Parent Emotional Support Moderation Model Predicting Frequency of Blood Glucose Monitoring

		B	Std. Error	Beta	T	Sig.
1	(Constant)	6.917	2.752		2.513	0.014
	Ethnicity	-0.020	0.212	-0.010	-0.096	0.924
	Income	0.245	0.195	0.129	1.252	0.214
	Age	-0.230	0.162	-0.142	-1.419	0.159
	Gender	0.254	0.498	0.051	0.511	0.611
2	(Constant)	7.499	2.847		2.634	0.010
	Ethnicity	-0.043	0.227	-0.021	-0.190	0.850
	Income	0.147	0.199	0.077	0.741	0.460
	Age	-0.240	0.163	-0.149	-1.472	0.144
	Gender	0.275	0.508	0.055	0.542	0.589
	Parent Cost-Benefit	0.088	0.280	0.035	0.316	0.753
	Parent Severity Susceptibility	-0.255	0.277	-0.102	-0.922	0.359
	Adolescent Cost-Benefit	-0.541	0.310	-0.216	-1.744	0.084
	Adolescent Severity Susceptibility	0.205	0.299	0.082	0.686	0.494
	Parent Emotional Support	0.302	0.288	0.119	1.050	0.296
3	(Constant)	7.050	2.891		2.439	0.017
	Ethnicity	-0.011	0.231	-0.005	-0.049	0.961
	Income	0.129	0.202	0.068	0.638	0.525
	Age	-0.228	0.165	-0.141	-1.384	0.170
	Gender	0.321	0.513	0.064	0.625	0.534
	Parent Cost-Benefit	0.115	0.285	0.046	0.403	0.688
	Parent Severity Susceptibility	-0.247	0.281	-0.098	-0.877	0.383
	Adolescent Cost-Benefit	-0.580	0.317	-0.231	-1.829	0.071
	Adolescent Severity Susceptibility	0.252	0.307	0.100	0.819	0.415
	Parent Emotional Support	0.199	0.303	0.078	0.656	0.514
	Parent SS X Par Emotional Sup	-0.159	0.341	-0.057	-0.466	0.643
	Parent CB X Par Emotional Sup	-0.016	0.374	-0.005	-0.043	0.965
	Adol SS X Par Emotional Sup	0.354	0.331	0.157	1.072	0.287

Adol CB X Par Emotional Sup			-0.525	0.318	-0.211	-1.649	0.103
	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	0.874	0.482	0.184	0.034	0.034	0.874	0.482
Model 2	1.267	0.265	0.327	0.107	0.073	1.561	0.179
Model 3	1.095	0.373	0.368	0.135	0.028	0.741	0.567

* indicates significance at $p < .05$ (p derived using Holm-Bonferroni)

Table 17.
Regression Results for Parent Emotional Support Moderation Model Predicting Metabolic Control (HbA1c)

		B	Std. Error	Beta	T	Sig.
1	(Constant)	14.135	1.728		8.182	0.000
	Ethnicity	-0.392	0.133	-0.280	-2.948*	0.004
	Income	-0.255	0.123	-0.199	-2.082	0.040
	Age	-0.143	0.102	-0.131	-1.407	0.163
	Gender	0.026	0.313	0.008	0.084	0.933
2	(Constant)	14.682	1.738		8.448	0.000
	Ethnicity	-0.423	0.139	-0.303	-3.052*	0.003
	Income	-0.179	0.121	-0.139	-1.475	0.144
	Age	-0.188	0.100	-0.173	-1.887	0.062
	Gender	0.049	0.310	0.015	0.157	0.876
	Parent Cost-Benefit	-0.037	0.171	-0.022	-0.218	0.828
	Parent Severity Susceptibility	0.478	0.169	0.283	2.830*	0.006
	Adolescent Cost-Benefit	0.167	0.189	0.099	0.885	0.379
	Adolescent Severity Susceptibility	0.116	0.183	0.069	0.635	0.527
	Parent Emotional Support	0.024	0.176	0.014	0.138	0.891
3	(Constant)	14.864	1.783		8.338	0.000
	Ethnicity	-0.435	0.143	-0.311	-3.050*	0.003
	Income	-0.168	0.124	-0.131	-1.350	0.180
	Age	-0.194	0.102	-0.178	-1.906	0.060
	Gender	0.019	0.316	0.006	0.059	0.953
	Parent Cost-Benefit	-0.053	0.176	-0.031	-0.303	0.763
	Parent Severity Susceptibility	0.495	0.174	0.293	2.851*	0.005
	Adolescent Cost-Benefit	0.173	0.196	0.102	0.885	0.379
	Adolescent Severity Susceptibility	0.110	0.189	0.065	0.583	0.562
	Parent Emotional Support	0.028	0.187	0.017	0.152	0.880
	Parent SS X Par Emotional Sup	-0.008	0.210	-0.004	-0.039	0.969
	Parent CB X Par Emotional Sup	-0.126	0.231	-0.055	-0.546	0.587
	Adol SS X Par Emotional Sup	-0.033	0.204	-0.022	-0.162	0.872

Adol CB X Par Emotional Sup			0.161	0.196	0.096	0.818	0.415
	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.805*	0.001	0.402	0.161	0.161	4.805*	0.001
Model 2	3.850*	0.000	0.517	0.267	0.008	2.750*	0.023
Model 3	2.664*	0.003	0.525	0.276	0.008	0.264	0.900

* indicates significance at $p < .025$ (p derived using Holm-Bonferroni)

Table 18.
Regression Results for Executive Functioning Moderation Model Predicting Adherence (SCI)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	69.276	9.021		7.679	.000
	Age	-1.635	.542	-.288	-3.018	.003
	Gender	-1.597	1.612	-.094	-.991	.324
	Income	.475	.623	.074	.762	.448
	Ethnicity	2.001	.664	.292	3.016	.003
2	(Constant)	68.931	9.042		7.623	.000
	Age	-1.450	.526	-.255	-2.757	.007
	Gender	-1.715	1.567	-.101	-1.095	.277
	Income	.226	.623	.035	.363	.717
	Ethnicity	1.766	.702	.258	2.514	.014
	Parent EF	-.317	.808	-.037	-.393	.695
	Adolescent EF	1.827	.855	.214	2.136	.036
	Parent Cost-Benefit	-.772	.873	-.093	-.884	.379
	Parent Severity Susceptibility	-.101	.895	-.012	-.113	.910
	Adolescent Cost-Benefit	-.877	.944	-.104	-.928	.356
	Adolescent Severity Susceptibility	-.498	.886	-.059	-.562	.576
3	(Constant)	58.464	9.188		6.363	.000
	Age	-.836	.522	-.147	-1.602	.114
	Gender	-2.017	1.514	-.119	-1.332	.187
	Income	-.066	.586	-.010	-.113	.910
	Ethnicity	2.197	.688	.321	3.194	.002
	Parent EF	-2.069	.935	-.244	-2.214	.030
	Adolescent EF	2.803	.985	.329	2.844	.006
	Parent Cost-Benefit	-.803	1.069	-.096	-.751	.455
	Parent Severity Susceptibility	1.300	1.061	.151	1.225	.225
	Adolescent Cost-Benefit	-1.507	.946	-.179	-1.593	.116
	Adolescent Severity Susceptibility	-1.730	.891	-.207	-1.941	.056
	Parent CB X Parent SS	-.980	.881	-.129	-1.113	.270
	Parent CB X Adolescent CB	-1.749	1.239	-.207	-1.411	.163
	Parent CB X Adolescent SS	1.659	1.420	.191	1.168	.247
	Parent CB X Parent EF	1.799	.858	.293	2.097	.040
	Parent CB X Adolescent EF	.717	.725	.114	.988	.327
	Parent SS X Adolescent CB	.292	1.041	.032	.280	.780

	Parent SS X Adolescent SS	-1.031	1.248	-.108	-.826	.412
	Parent SS X Parent EF	-.937	1.069	-.101	-.876	.384
	Parent SS X Adolescent EF	-.605	.606	-.131	-.999	.321
	Adolescent CB X Adolescent SS	1.251	.769	.249	1.628	.108
	Adolescent CB X Parent EF	-.232	1.320	-.032	-.176	.861
	Adolescent CB X Adolescent EF	.108	1.010	.011	.107	.915
	Adolescent SS X Parent EF	1.538	.954	.258	1.612	.111
	Adolescent SS X Adolescent EF	-.837	1.271	-.073	-.659	.512
	Parent EF X Adolescent EF	1.221	1.141	.117	1.070	.288
4	(Constant)	55.817	11.721		4.762	.000
	Age	-.573	.625	-.101	-.918	.363
	Gender	-2.900	1.876	-.171	-1.546	.128
	Income	.321	.776	.050	.413	.681
	Ethnicity	1.938	.917	.283	2.114	.039
	Parent EF	-3.176	1.542	-.375	-2.059	.045
	Adolescent EF	2.823	1.483	.331	1.903	.063
	Parent Cost-Benefit	-.397	1.999	-.048	-.198	.844
	Parent Severity Susceptibility	1.478	1.419	.172	1.041	.303
	Adolescent Cost-Benefit	-1.944	1.413	-.230	-1.376	.175
	Adolescent Severity Susceptibility	-1.378	1.381	-.164	-.998	.323
	Parent CB X Parent SS	-2.331	1.572	-.307	-1.483	.144
	Parent CB X Adolescent CB	-1.909	1.914	-.226	-.997	.323
	Parent CB X Adolescent SS	2.513	1.958	.289	1.283	.205
	Parent CB X Parent EF	1.250	1.966	.204	.636	.528
	Parent CB X Adolescent EF	-.025	1.454	-.004	-.017	.986
	Parent SS X Adolescent CB	.568	1.746	.063	.326	.746
	Parent SS X Adolescent SS	-1.137	1.799	-.119	-.632	.530
	Parent SS X Parent EF	-1.129	1.812	-.122	-.623	.536
	Parent SS X Adolescent EF	.740	1.727	.160	.429	.670
	Adolescent CB X Adolescent SS	1.816	1.150	.362	1.579	.121
	Adolescent CB X Parent EF	-.878	2.035	-.121	-.431	.668
	Adolescent CB X Adolescent EF	-.500	1.729	-.050	-.289	.773
	Adolescent SS X Parent EF	.813	1.637	.136	.497	.622

	Adolescent SS X Adolescent EF	-.168	2.105	-.015	-.080	.937
	Parent EF X Adolescent EF	-.302	1.900	-.029	-.159	.874
	Par CB X Par SS X Adolescent CB	1.182	1.949	.138	.606	.547
	Par CB X Par SS X Adolescent SS	-3.672	1.887	-.410	-1.946	.057
	Par CB X Par SS X Par EF	1.144	1.729	.158	.662	.511
	Par CB X Par SS X Adolescent EF	.605	1.394	.178	.434	.666
	Par CB X Adol CB X Adol SS	.146	2.180	.036	.067	.947
	Par CB X Adol CB X Par EF	-2.916	2.975	-.569	-.980	.332
	Par CB X Adol CB X Adol EF	-2.546	2.210	-.360	-1.152	.255
	Par CB X Adol SS X Par EF	.251	2.454	.053	.102	.919
	Par CB X Adol SS X Adol EF	-.044	2.176	-.005	-.020	.984
	Par CB X Par EF X Adol EF	-.333	1.573	-.068	-.212	.833
	Par SS X Adol CB X Adol SS	-.438	1.440	-.085	-.304	.762
	Par SS X Adol CB X Par EF	1.416	2.233	.190	.634	.529
	Par SS X Adol SS X Par EF	.154	2.445	.020	.063	.950
	Par SS X Adol SS X Adol EF	-3.884	2.463	-.348	-1.577	.121
	Par SS X Adol EF X Par EF	.204	2.202	.032	.093	.926
	Adol CB X Adol SS X Par EF	1.764	1.586	.763	1.112	.271
	Adol CB X Adol SS X Adol EF	2.683	2.144	.322	1.252	.216
	Adol CB X Par EF X Adol EF	-.402	2.823	-.039	-.142	.887
	Adol SS X Par EF X Adol EF	3.870	3.451	.339	1.122	.267
5	(Constant)	53.634	12.917		4.152	.000
	Age	-.597	.696	-.105	-.859	.396
	Gender	-1.770	2.174	-.104	-.814	.421
	Income	.389	.904	.061	.430	.670
	Ethnicity	2.084	1.028	.304	2.027	.050
	Parent EF	-4.135	2.129	-.488	-1.942	.060
	Adolescent EF	2.673	2.564	.314	1.043	.304
	Parent Cost-Benefit	.323	2.508	.039	.129	.898
	Parent Severity Susceptibility	1.835	2.050	.213	.895	.377

Adolescent Cost-Benefit	.168	1.841	.020	.091	.928
Adolescent Severity Susceptibility	-1.334	1.828	-.159	-.730	.470
Parent CB X Parent SS	-2.737	3.592	-.361	-.762	.451
Parent CB X Adolescent CB	-1.722	3.099	-.204	-.556	.582
Parent CB X Adolescent SS	2.523	3.427	.290	.736	.466
Parent CB X Parent EF	3.591	4.030	.585	.891	.379
Parent CB X Adolescent EF	-.130	2.667	-.021	-.049	.961
Parent SS X Adolescent CB	3.670	2.814	.404	1.304	.201
Parent SS X Adolescent SS	-3.349	2.507	-.349	-1.336	.190
Parent SS X Parent EF	-1.772	3.087	-.191	-.574	.570
Parent SS X Adolescent EF	.470	2.623	.102	.179	.859
Adolescent CB X Adolescent SS	.470	2.077	.094	.226	.822
Adolescent CB X Parent EF	2.081	2.845	.288	.732	.469
Adolescent CB X Adolescent EF	1.743	3.288	.174	.530	.599
Adolescent SS X Parent EF	2.266	2.357	.380	.961	.343
Adolescent SS X Adolescent EF	1.406	3.379	.122	.416	.680
Parent EF X Adolescent EF	-1.084	3.591	-.104	-.302	.765
Par CB X Par SS X Adolescent CB	.560	3.248	.065	.172	.864
Par CB X Par SS X Adolescent SS	-3.529	3.760	-.394	-.938	.354
Par CB X Par SS X Par EF	-.974	3.645	-.135	-.267	.791
Par CB X Par SS X Adolescent EF	.826	3.642	.243	.227	.822
Par CB X Adol CB X Adol SS	2.253	3.875	.557	.581	.565
Par CB X Adol CB X Par EF	-5.204	4.453	-1.015	-1.169	.250
Par CB X Adol CB X Adol EF	-3.456	4.187	-.489	-.825	.415
Par CB X Adol SS X Par EF	3.804	4.198	.809	.906	.371
Par CB X Adol SS X Adol EF	.864	5.272	.102	.164	.871
Par CB X Par EF X Adol EF	-3.702	4.372	-.757	-.847	.403
Par SS X Adol CB X Adol SS	2.486	2.846	.481	.874	.388
Par SS X Adol CB X Par EF	5.499	3.760	.738	1.462	.152
Par SS X Adol SS X Par EF	-5.511	3.919	-.711	-1.406	.168

	Par SS X Adol SS X Adol EF	-3.205	3.793	-.287	-.845	.404
	Par SS X Adol EF X Par EF	1.195	4.630	.185	.258	.798
	Adol CB X Adol SS X Par EF	-.898	2.928	-.388	-.307	.761
	Adol CB X Adol SS X Adol EF	9.433	5.329	1.132	1.770	.085
	Adol CB X Par EF X Adol EF	2.334	6.363	.225	.367	.716
	Adol SS X Par EF X Adol EF	4.950	5.307	.433	.933	.357
	Par CB X Par SS X Adol CB X Adol SS	-.296	3.903	-.072	-.076	.940
	Par CB X Par SS X Adol CB X Par EF	-4.068	4.840	-.635	-.840	.406
	Par CB X Par SS X Adol CB X Adol EF	-.294	4.009	-.051	-.073	.942
	Par CB X Adol SS X Par SS X Par EF	-2.543	6.979	-.402	-.364	.718
	Par CB X Adol SS X Par SS X Adol EF	-4.199	3.831	-.442	-1.096	.280
	Par CB X Par SS X Par EF X Adol EF	2.295	3.266	.519	.703	.487
	Par CB X Adol CB X Adol SS X Par EF	7.431	5.453	4.102	1.363	.181
	Par CB X Adol SS X Adol CB X Adol EF	-3.532	4.669	-.562	-.756	.454
	Par CB X Adol CB X Par EF X Adol EF	6.843	5.609	1.476	1.220	.230
	Par CB X Adol SS X Par EF X Adol EF	.104	8.128	.017	.013	.990
	Par SS X Adol CB X Adol SS X Par EF	2.415	4.365	.983	.553	.583
	Par SS X Adol CB X Adol SS X Adol EF	2.736	2.992	.337	.914	.367
	Par SS X Adol CB X Par EF X Adol EF	-.668	3.362	-.078	-.199	.844
	Par SS X Adol SS X Par EF X Adol EF	-2.056	7.354	-.157	-.280	.781
	Adol CB X Adol SS X Par EF X Adol EF	15.750	8.832	3.154	1.783	.083
6	(Constant)	51.038	15.014		3.399	.002

Age	-.480	.843	-.084	-.569	.574
Gender	-1.378	2.366	-.081	-.582	.565
Income	.912	1.180	.143	.773	.445
Ethnicity	1.948	1.144	.284	1.703	.099
Parent EF	-3.879	2.618	-.458	-1.482	.149
Adolescent EF	1.694	3.095	.199	.547	.588
Parent Cost-Benefit	-2.103	3.289	-.253	-.640	.527
Parent Severity Susceptibility	-.223	2.533	-.026	-.088	.931
Adolescent Cost-Benefit	1.007	2.043	.119	.493	.626
Adolescent Severity Susceptibility	-2.126	2.492	-.254	-.853	.400
Parent CB X Parent SS	-.665	5.882	-.088	-.113	.911
Parent CB X Adolescent CB	-1.224	3.531	-.145	-.347	.731
Parent CB X Adolescent SS	5.712	4.781	.657	1.195	.242
Parent CB X Parent EF	-.039	6.183	-.006	-.006	.995
Parent CB X Adolescent EF	1.699	3.080	.271	.552	.585
Parent SS X Adolescent CB	5.978	3.909	.658	1.529	.137
Parent SS X Adolescent SS	-8.789	4.330	-.917	-2.030	.051
Parent SS X Parent EF	-5.109	4.995	-.552	-1.023	.315
Parent SS X Adolescent EF	.612	3.291	.133	.186	.854
Adolescent CB X Adolescent SS	-.670	2.537	-.134	-.264	.793
Adolescent CB X Parent EF	2.523	3.072	.349	.821	.418
Adolescent CB X Adolescent EF	2.633	3.598	.263	.732	.470
Adolescent SS X Parent EF	.096	3.049	.016	.032	.975
Adolescent SS X Adolescent EF	-.622	4.234	-.054	-.147	.884
Parent EF X Adolescent EF	-4.176	4.895	-.402	-.853	.400
Par CB X Par SS X Adolescent CB	-5.833	7.974	-.680	-.732	.470
Par CB X Par SS X Adolescent SS	-.383	4.977	-.043	-.077	.939
Par CB X Par SS X Par EF	-6.812	7.779	-.942	-.876	.388
Par CB X Par SS X Adolescent EF	-2.959	4.430	-.870	-.668	.509
Par CB X Adol CB X Adol SS	3.094	4.244	.765	.729	.472
Par CB X Adol CB X Par EF	.917	7.760	.179	.118	.907

Par CB X Adol CB X Adol EF	-4.478	5.114	-.633	-.876	.388
Par CB X Adol SS X Par EF	7.476	6.417	1.590	1.165	.253
Par CB X Adol SS X Adol EF	-.987	7.152	-.117	-.138	.891
Par CB X Par EF X Adol EF	-2.814	7.142	-.576	-.394	.696
Par SS X Adol CB X Adol SS	4.707	3.736	.910	1.260	.217
Par SS X Adol CB X Par EF	6.364	4.597	.854	1.384	.176
Par SS X Adol SS X Par EF	-12.057	7.515	-1.555	-1.604	.119
Par SS X Adol SS X Adol EF	-2.532	6.279	-.227	-.403	.690
Par SS X Adol EF X Par EF	-.049	5.261	-.008	-.009	.993
Adol CB X Adol SS X Par EF	1.268	4.522	.548	.281	.781
Adol CB X Adol SS X Adol EF	12.748	7.081	1.530	1.800	.082
Adol CB X Par EF X Adol EF	6.744	7.447	.649	.906	.372
Adol SS X Par EF X Adol EF	-.479	8.481	-.042	-.057	.955
Par CB X Par SS X Adol CB X Adol SS	-7.448	9.159	-1.804	-.813	.422
Par CB X Par SS X Adol CB X Par EF	-9.999	7.315	-1.562	-1.367	.182
Par CB X Par SS X Adol CB X Adol EF	-.951	5.893	-.164	-.161	.873
Par CB X Adol SS X Par SS X Par EF	-3.183	8.307	-.503	-.383	.704
Par CB X Adol SS X Par SS X Adol EF	-9.098	6.820	-.958	-1.334	.192
Par CB X Par SS X Par EF X Adol EF	7.129	5.106	1.613	1.396	.173
Par CB X Adol CB X Adol SS X Par EF	1.366	7.768	.754	.176	.862
Par CB X Adol SS X Adol CB X Adol EF	-1.629	6.894	-.259	-.236	.815
Par CB X Adol CB X Par EF X Adol EF	2.680	7.714	.578	.347	.731
Par CB X Adol SS X Par EF X Adol EF	-12.816	14.873	-2.047	-.862	.396
Par SS X Adol CB X Adol SS X Par EF	9.808	6.660	3.991	1.473	.151

Par SS X Adol CB X Adol SS X Adol EF	-.513	8.113	-.063	-.063	.950
Par SS X Adol CB X Par EF X Adol EF	-4.098	4.720	-.479	-.868	.392
Par SS X Adol SS X Par EF X Adol EF	.782	14.183	.060	.055	.956
Adol CB X Adol SS X Par EF X Adol EF	24.155	11.163	4.837	2.164	.039
Par CB X Par SS X Adol CB X Adol SS X Par EF	-13.169	10.807	-6.777	-1.219	.232
Par CB X Par SS X Adol CB X Adol SS X Adol EF	-1.612	7.584	-.257	-.213	.833
Par CB X Par SS X Adol CB X Par EF X Adol EF	-4.519	11.112	-.669	-.407	.687
Par CB X Par SS X Adol SS X Par EF X Adol EF	-15.843	21.105	-1.626	-.751	.459
Par CB X Adol CB X Adol SS X Par EF X Adol EF	13.662	12.542	4.027	1.089	.285
Par SS X Adol SS X Par EF X Adol EF	-.105	14.089	-.020	-.007	.994

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	6.128*	0.000	.186[a]	.034	.034	.750	.561
Model 2	4.168*	0.000	.376[b]	.141	.107	1.612	.155
Model 3	3.597*	0.000	.483[c]	.233	.092	.505	.929
Model 4	2.017*	0.008	.724[d]	.525	.292	1.421	.167
Model 5	1.694	0.046	.814[e]	.662	.137	.783	.685
Model 6	1.505	0.110	.860[f]	.739	.077	1.137	.373

* indicates significance at $p < .017$ (p derived u sing Holm-Bonferroni)

Table 19.
Regression Results for Executive Functioning Moderation Model Predicting Frequency of Blood Glucose Monitoring

		B	Std. Error	Beta	t	Sig.
1	(Constant)	7.053	3.099		2.276	.025
	Age	-.232	.183	-.139	-1.268	.208
	Gender	.148	.553	.029	.268	.789
	Income	.272	.214	.147	1.275	.206
	Ethnicity	-.042	.257	-.019	-.165	.869
2	(Constant)	7.149	3.209		2.228	.029
	Age	-.202	.182	-.121	-1.111	.270
	Gender	.131	.559	.026	.234	.816
	Income	.259	.220	.139	1.179	.242
	Ethnicity	-.129	.286	-.057	-.453	.652
	Parent EF	.376	.283	.150	1.329	.188
	Adolescent EF	.448	.304	.177	1.477	.144
	Parent Cost-Benefit	-.091	.340	-.034	-.267	.790
	Parent Severity Susceptibility	-.143	.320	-.057	-.448	.655
	Adolescent Cost-Benefit	-.584	.339	-.231	-1.723	.089
	Adolescent Severity Susceptibility	.236	.318	.095	.743	.460
3	(Constant)	7.301	3.910		1.867	.067
	Age	-.220	.214	-.132	-1.030	.307
	Gender	.363	.660	.072	.550	.584
	Income	.302	.241	.163	1.255	.214
	Ethnicity	-.192	.326	-.085	-.590	.557
	Parent EF	.451	.386	.179	1.167	.248
	Adolescent EF	.271	.424	.107	.638	.526
	Parent Cost-Benefit	-.797	.491	-.298	-1.624	.109
	Parent Severity Susceptibility	.206	.465	.082	.442	.660
	Adolescent Cost-Benefit	-.626	.427	-.248	-1.466	.148
	Adolescent Severity Susceptibility	.253	.381	.102	.663	.510
	Parent CB X Parent SS	.455	.380	.205	1.198	.235
	Parent CB X Adolescent CB	-.391	.568	-.139	-.688	.494
	Parent CB X Adolescent SS	.511	.601	.191	.850	.398
	Parent CB X Parent EF	-.023	.394	-.010	-.057	.955
	Parent CB X Adolescent EF	.317	.343	.149	.924	.359

	Parent SS X Adolescent CB	.244	.434	.092	.562	.576
	Parent SS X Adolescent SS	-.302	.529	-.107	-.571	.570
	Parent SS X Parent EF	-.356	.437	-.132	-.815	.418
	Parent SS X Adolescent EF	.091	.250	.069	.365	.716
	Adolescent CB X Adolescent SS	-.077	.351	-.053	-.219	.827
	Adolescent CB X Parent EF	.051	.561	.024	.091	.927
	Adolescent CB X Adolescent EF	.043	.428	.014	.101	.920
	Adolescent SS X Parent EF	.052	.405	.030	.130	.897
	Adolescent SS X Adolescent EF	-.302	.528	-.089	-.573	.569
	Parent EF X Adolescent EF	.495	.553	.149	.896	.374
4	(Constant)	3.273	4.504		.727	.471
	Age	-.073	.232	-.043	-.314	.755
	Gender	.950	.689	.187	1.379	.175
	Income	.433	.280	.233	1.547	.129
	Ethnicity	-.122	.377	-.054	-.324	.747
	Parent EF	.025	.665	.010	.038	.970
	Adolescent EF	-.173	.646	-.068	-.267	.791
	Parent Cost-Benefit	-.992	.754	-.371	-1.316	.195
	Parent Severity Susceptibility	.125	.579	.050	.216	.830
	Adolescent Cost-Benefit	-.077	.583	-.031	-.133	.895
	Adolescent Severity Susceptibility	-.069	.527	-.028	-.132	.896
	Parent CB X Parent SS	-.563	.667	-.253	-.844	.403
	Parent CB X Adolescent CB	-1.111	.761	-.396	-1.460	.151
	Parent CB X Adolescent SS	1.346	.798	.503	1.686	.099
	Parent CB X Parent EF	.798	.812	.367	.983	.331
	Parent CB X Adolescent EF	-.681	.759	-.320	-.897	.375
	Parent SS X Adolescent CB	.214	.736	.081	.291	.773
	Parent SS X Adolescent SS	.473	.777	.169	.609	.545
	Parent SS X Parent EF	-.419	.693	-.155	-.605	.549

Parent SS X Adolescent EF	.754	.701	.567	1.075	.288
Adolescent CB X Adolescent SS	-.322	.453	-.221	-.710	.481
Adolescent CB X Parent EF	-.015	.811	-.007	-.018	.986
Adolescent CB X Adolescent EF	-.622	.905	-.204	-.686	.496
Adolescent SS X Parent EF	.012	.652	.007	.018	.986
Adolescent SS X Adolescent EF	-.411	1.044	-.120	-.394	.696
Parent EF X Adolescent EF	-.219	.921	-.066	-.238	.813
Par CB X Par SS X Adolescent CB	-.050	.734	-.020	-.068	.946
Par CB X Par SS X Adolescent SS	-.914	.760	-.351	-1.202	.236
Par CB X Par SS X Par EF	1.386	.814	.643	1.703	.096
Par CB X Par SS X Adolescent EF	1.758	.718	1.788	2.448	.018
Par CB X Adol CB X Adol SS	-.589	.805	-.497	-.732	.468
Par CB X Adol CB X Par EF	.162	1.147	.089	.141	.888
Par CB X Adol CB X Adol EF	1.479	.815	.494	1.814	.076
Par CB X Adol SS X Par EF	-.064	.990	-.044	-.065	.949
Par CB X Adol SS X Adol EF	-3.015	.932	-1.011	-3.233	.002
Par CB X Par EF X Adol EF	-2.229	1.010	-.888	-2.206	.033
Par SS X Adol CB X Adol SS	-.065	.536	-.044	-.122	.904
Par SS X Adol CB X Par EF	-.075	.978	-.035	-.077	.939
Par SS X Adol SS X Par EF	1.254	1.128	.559	1.112	.272
Par SS X Adol SS X Adol EF	.855	.906	.266	.943	.351
Par SS X Adol EF X Par EF	.800	.865	.429	.926	.360
Adol CB X Adol SS X Par EF	-.104	.722	-.156	-.144	.886

	Adol CB X Adol SS X Adol EF	-.937	.793	-.384	-1.181	.244
	Adol CB X Par EF X Adol EF	-1.592	1.576	-.459	-1.010	.318
	Adol SS X Par EF X Adol EF	-.324	1.795	-.091	-.181	.857
5	(Constant)	.818	5.444		.150	.882
	Age	.123	.292	.073	.421	.677
	Gender	1.353	.821	.267	1.648	.110
	Income	.430	.346	.232	1.241	.224
	Ethnicity	-.315	.434	-.139	-.726	.474
	Parent EF	.725	.913	.289	.794	.434
	Adolescent EF	.176	1.055	.069	.167	.869
	Parent Cost-Benefit	-.469	1.018	-.175	-.461	.648
	Parent Severity Susceptibility	.610	.887	.244	.687	.497
	Adolescent Cost-Benefit	.466	.746	.184	.624	.537
	Adolescent Severity Susceptibility	.147	.776	.059	.189	.851
	Parent CB X Parent SS	-.525	1.426	-.236	-.368	.715
	Parent CB X Adolescent CB	-.405	1.351	-.145	-.300	.766
	Parent CB X Adolescent SS	.829	1.510	.310	.549	.587
	Parent CB X Parent EF	1.685	1.732	.776	.973	.339
	Parent CB X Adolescent EF	-1.335	1.174	-.628	-1.136	.265
	Parent SS X Adolescent CB	.202	1.288	.076	.156	.877
	Parent SS X Adolescent SS	.925	1.234	.329	.749	.460
	Parent SS X Parent EF	.009	1.417	.003	.006	.995
	Parent SS X Adolescent EF	.163	1.120	.123	.146	.885
	Adolescent CB X Adolescent SS	.254	.890	.175	.286	.777
	Adolescent CB X Parent EF	.700	1.210	.330	.578	.568
	Adolescent CB X Adolescent EF	-.126	1.589	-.041	-.079	.937
	Adolescent SS X Parent EF	-.300	1.009	-.173	-.297	.768
	Adolescent SS X Adolescent EF	.770	1.809	.225	.426	.674
	Parent EF X Adolescent EF	.858	1.584	.259	.542	.592

Par CB X Par SS X Adolescent CB	-.004	1.504	-.002	-.003	.998
Par CB X Par SS X Adolescent SS	-.979	1.660	-.376	-.589	.560
Par CB X Par SS X Par EF	2.027	1.506	.941	1.346	.189
Par CB X Par SS X Adolescent EF	1.806	1.496	1.837	1.208	.237
Par CB X Adol CB X Adol SS	.002	1.747	.002	.001	.999
Par CB X Adol CB X Par EF	-.458	1.848	-.251	-.248	.806
Par CB X Adol CB X Adol EF	2.937	1.688	.980	1.740	.092
Par CB X Adol SS X Par EF	1.049	1.982	.724	.529	.601
Par CB X Adol SS X Adol EF	-3.072	2.536	-1.031	-1.211	.236
Par CB X Par EF X Adol EF	-.969	2.028	-.386	-.478	.636
Par SS X Adol CB X Adol SS	-.383	1.102	-.257	-.348	.731
Par SS X Adol CB X Par EF	-.281	1.623	-.131	-.173	.864
Par SS X Adol SS X Par EF	1.155	2.089	.515	.553	.585
Par SS X Adol SS X Adol EF	1.901	1.667	.591	1.141	.263
Par SS X Adol EF X Par EF	-1.296	1.963	-.695	-.660	.514
Adol CB X Adol SS X Par EF	-.489	1.111	-.735	-.440	.663
Adol CB X Adol SS X Adol EF	1.167	2.188	.478	.534	.598
Adol CB X Par EF X Adol EF	.291	2.801	.084	.104	.918
Adol SS X Par EF X Adol EF	2.536	2.785	.714	.911	.370
Par CB X Par SS X Adol CB X Adol SS	-.953	1.457	-.801	-.654	.518
Par CB X Par SS X Adol CB X Par EF	-1.171	1.938	-.610	-.604	.550
Par CB X Par SS X Adol CB X Adol EF	-.761	1.734	-.443	-.439	.664
Par CB X Adol SS X Par SS X Par EF	2.427	3.120	1.314	.778	.443

	Par CB X Adol SS X Par SS X Adol EF	.105	1.620	.037	.065	.949
	Par CB X Par SS X Par EF X Adol EF	-1.248	1.409	-.943	-.885	.383
	Par CB X Adol CB X Adol SS X Par EF	1.435	2.288	2.724	.627	.535
	Par CB X Adol SS X Adol CB X Adol EF	2.336	2.084	1.131	1.121	.272
	Par CB X Adol CB X Par EF X Adol EF	4.060	2.923	1.197	1.389	.175
	Par CB X Adol SS X Par EF X Adol EF	-.995	4.704	-.327	-.211	.834
	Par SS X Adol CB X Adol SS X Par EF	.061	2.191	.087	.028	.978
	Par SS X Adol CB X Adol SS X Adol EF	-.191	1.262	-.082	-.151	.881
	Par SS X Adol CB X Par EF X Adol EF	-.857	1.557	-.344	-.550	.586
	Par SS X Adol SS X Par EF X Adol EF	3.945	3.055	1.035	1.291	.207
	Adol CB X Adol SS X Par EF X Adol EF	1.371	3.675	.940	.373	.712
6	(Constant)	7.431	6.540		1.136	.268
	Age	-.287	.384	-.171	-.747	.463
	Gender	1.560	.849	.308	1.838	.079
	Income	.623	.400	.336	1.555	.134
	Ethnicity	-.431	.465	-.190	-.926	.364
	Parent EF	1.400	1.234	.557	1.135	.268
	Adolescent EF	1.230	1.375	.486	.895	.380
	Parent Cost-Benefit	-1.316	1.196	-.492	-1.100	.283
	Parent Severity Susceptibility	.062	1.087	.025	.057	.955
	Adolescent Cost-Benefit	.164	.965	.065	.170	.867
	Adolescent Severity Susceptibility	-.388	1.014	-.157	-.383	.705
	Parent CB X Parent SS	-2.825	2.735	-1.270	-1.033	.312
	Parent CB X Adolescent CB	.809	1.777	.288	.455	.653
	Parent CB X Adolescent SS	3.526	1.977	1.317	1.783	.088
	Parent CB X Parent EF	-1.445	2.816	-.665	-.513	.613
	Parent CB X Adolescent EF	-1.479	1.392	-.696	-1.063	.299
	Parent SS X Adolescent CB	-1.872	2.440	-.709	-.767	.451

Parent SS X Adolescent SS	-1.486	1.837	-.529	-.809	.427
Parent SS X Parent EF	-2.143	2.183	-.794	-.982	.336
Parent SS X Adolescent EF	1.393	1.307	1.047	1.066	.298
Adolescent CB X Adolescent SS	.994	1.113	.684	.893	.381
Adolescent CB X Parent EF	1.867	1.410	.880	1.325	.198
Adolescent CB X Adolescent EF	-.112	1.742	-.037	-.064	.949
Adolescent SS X Parent EF	-2.484	1.521	-1.430	-1.633	.116
Adolescent SS X Adolescent EF	1.542	2.424	.451	.636	.531
Parent EF X Adolescent EF	1.669	2.315	.503	.721	.478
Par CB X Par SS X Adolescent CB	-4.277	3.393	-1.693	-1.261	.220
Par CB X Par SS X Adolescent SS	-1.581	1.937	-.608	-.816	.423
Par CB X Par SS X Par EF	-3.281	3.935	-1.524	-.834	.413
Par CB X Par SS X Adolescent EF	.331	1.730	.336	.191	.850
Par CB X Adol CB X Adol SS	-1.733	2.467	-1.463	-.702	.490
Par CB X Adol CB X Par EF	3.532	3.154	1.932	1.120	.274
Par CB X Adol CB X Adol EF	2.908	2.296	.971	1.267	.218
Par CB X Adol SS X Par EF	3.920	2.508	2.707	1.563	.132
Par CB X Adol SS X Adol EF	-5.537	3.189	-1.857	-1.736	.096
Par CB X Par EF X Adol EF	.229	3.109	.091	.074	.942
Par SS X Adol CB X Adol SS	-.467	1.457	-.314	-.321	.751
Par SS X Adol CB X Par EF	-1.654	2.157	-.770	-.767	.451
Par SS X Adol SS X Par EF	-4.160	3.508	-1.856	-1.186	.248
Par SS X Adol SS X Adol EF	-2.037	2.750	-.634	-.741	.466

Par SS X Adol EF X Par EF	-.223	2.254	-.119	-.099	.922
Adol CB X Adol SS X Par EF	.377	2.102	.567	.180	.859
Adol CB X Adol SS X Adol EF	-1.497	3.517	-.613	-.426	.674
Adol CB X Par EF X Adol EF	1.938	3.273	.559	.592	.560
Adol SS X Par EF X Adol EF	1.411	4.032	.397	.350	.729
Par CB X Par SS X Adol CB X Adol SS	-5.205	3.561	-4.373	-1.462	.157
Par CB X Par SS X Adol CB X Par EF	-2.666	3.111	-1.388	-.857	.400
Par CB X Par SS X Adol CB X Adol EF	-.311	2.264	-.181	-.137	.892
Par CB X Adol SS X Par SS X Par EF	.162	3.343	.088	.049	.962
Par CB X Adol SS X Par SS X Adol EF	-4.716	3.842	-1.669	-1.228	.232
Par CB X Par SS X Par EF X Adol EF	.801	1.902	.606	.421	.677
Par CB X Adol CB X Adol SS X Par EF	-1.529	3.347	-2.903	-.457	.652
Par CB X Adol SS X Adol CB X Adol EF	6.410	3.207	3.103	1.998	.058
Par CB X Adol CB X Par EF X Adol EF	2.429	3.934	.716	.617	.543
Par CB X Adol SS X Par EF X Adol EF	-9.821	6.581	-3.227	-1.492	.149
Par SS X Adol CB X Adol SS X Par EF	-2.514	3.826	-3.560	-.657	.518
Par SS X Adol CB X Adol SS X Adol EF	-7.145	4.669	-3.053	-1.530	.140
Par SS X Adol CB X Par EF X Adol EF	-2.382	1.874	-.956	-1.271	.217
Par SS X Adol SS X Par EF X Adol EF	-6.045	7.839	-1.587	-.771	.448
Adol CB X Adol SS X Par EF X Adol EF	-1.741	5.737	-1.194	-.303	.764
Par CB X Par SS X Adol CB X Adol SS X Par EF	-6.337	4.273	-11.330	-1.483	.152
Par CB X Par SS X Adol CB X Adol SS X Adol EF	1.208	3.188	.659	.379	.708

Par CB X Par SS X Adol CB X Par EF X Adol EF	-6.016	4.295	-2.633	-1.401	.175
Par CB X Par SS X Adol SS X Par EF X Adol EF	-14.358	11.076	-4.504	-1.296	.208
Par CB X Adol CB X Adol SS X Par EF X Adol EF	13.038	5.741	11.411	2.271	.033
Par SS X Adol SS X Par EF X Adol EF	-12.073	7.933	-7.988	-1.522	.142

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	.750	.561	.412[a]	.170	.170	4.593	.002
Model 2	1.280	.256	.570[b]	.325	.155	3.221	.007
Model 3	.767	.766	.624[c]	.390	.065	.488	.939
Model 4	1.104	.372	.787[d]	.619	.229	1.582	.099
Model 5	.962	.563	.830[e]	.689	.070	.528	.907
Model 6	1.003	.519	.852[f]	.725	.036	.636	.700

* indicates significance at $p < .05$ (p derived using Holm – Bonferroni)

Table 20.
Regression Results for Executive Functioning Moderation Model Predicting Metabolic Control (HbA1c)

		B	Std. Error	Beta	t	Sig
1	(Constant)	13.589	1.852		7.337	.000
	Age	-.099	.111	-.088	-.893	.374
	Gender	.076	.331	.023	.230	.818
	Income	-.271	.126	-.216	-2.152	.034
	Ethnicity	-.416	.139	-.296	-2.984	.004
2	(Constant)	14.234	1.815		7.842	.000
	Age	-.144	.105	-.128	-1.375	.173
	Gender	.088	.316	.026	.279	.781
	Income	-.235	.123	-.188	-1.919	.058
	Ethnicity	-.433	.145	-.308	-2.994	.004
	Parent Executive Functioning	-.289	.161	-.172	-1.791	.077
	Adolescent Executive Functioning	-.282	.173	-.166	-1.632	.106
	Parent Cost-Benefit	-.022	.176	-.013	-.124	.901
	Parent Severity Susceptibility	.424	.179	.248	2.366	.020
	Adolescent Cost-Benefit	.177	.190	.105	.931	.354
	Adolescent Severity Susceptibility	.065	.180	.039	.359	.720
3	(Constant)	13.061	2.180		5.990	.000
	Age	-.089	.122	-.079	-.729	.468
	Gender	-.048	.361	-.014	-.132	.896
	Income	-.219	.135	-.175	-1.615	.111
	Ethnicity	-.357	.168	-.254	-2.126	.037
	Parent Executive Functioning	-.274	.220	-.163	-1.243	.218
	Adolescent Executive Functioning	-.280	.233	-.165	-1.200	.234
	Parent Cost-Benefit	.090	.254	.055	.354	.724
	Parent Severity Susceptibility	.415	.252	.243	1.644	.105
	Adolescent Cost-Benefit	.114	.227	.068	.503	.616
	Adolescent Severity Susceptibility	.021	.212	.013	.100	.920
	Parent CB X Parent SS	-.024	.207	-.016	-.114	.909
	Parent CB X Adolescent CB	-.277	.293	-.165	-.944	.349
	Parent CB X Adolescent SS	.449	.337	.261	1.333	.187
	Parent CB X Parent EF	-.066	.203	-.055	-.327	.744
	Parent CB X Adolescent EF	.073	.171	.058	.425	.673
	Parent SS X Adolescent CB	.073	.247	.040	.294	.770
	Parent SS X Adolescent SS	-.149	.299	-.078	-.498	.620
	Parent SS X Parent EF	.085	.254	.046	.336	.738
	Parent SS X Adolescent EF	.065	.143	.071	.453	.652
	Adolescent CB X Adolescent SS	.087	.183	.087	.474	.637

	Adolescent CB X Parent EF	-.099	.314	-.069	-.314	.754
	Adolescent CB X Adolescent EF	-.342	.242	-.170	-1.415	.162
	Adolescent SS X Parent EF	-.104	.225	-.088	-.460	.647
	Adolescent SS X Adolescent EF	.266	.299	.116	.888	.378
	Parent EF X Adolescent EF	-.517	.271	-.251	-1.910	.060
4	(Constant)	12.820	2.426		5.285	.000
	Age	-.133	.127	-.118	-1.048	.300
	Gender	-.222	.389	-.066	-.571	.571
	Income	-.268	.154	-.214	-1.747	.087
	Ethnicity	-.115	.195	-.082	-.591	.557
	Parent EF	-.902	.320	-.538	-2.824	.007
	Adolescent EF	-.462	.304	-.272	-1.523	.134
	Parent Cost-Benefit	.503	.410	.305	1.229	.225
	Parent Severity Susceptibility	.590	.294	.346	2.003	.051
	Adolescent Cost-Benefit	.264	.295	.157	.895	.375
	Adolescent Severity Susceptibility	-.050	.286	-.030	-.174	.863
	Parent CB X Parent SS	-.002	.321	-.001	-.005	.996
	Parent CB X Adolescent CB	-.157	.394	-.094	-.398	.692
	Parent CB X Adolescent SS	.086	.401	.050	.216	.830
	Parent CB X Parent EF	-.149	.403	-.123	-.370	.713
	Parent CB X Adolescent EF	-.204	.298	-.164	-.686	.496
	Parent SS X Adolescent CB	-.144	.358	-.080	-.402	.689
	Parent SS X Adolescent SS	.018	.374	.009	.048	.962
	Parent SS X Parent EF	.450	.376	.245	1.198	.236
	Parent SS X Adolescent EF	-.164	.353	-.179	-.464	.645
	Adolescent CB X Adolescent SS	-.328	.236	-.329	-1.387	.172
	Adolescent CB X Parent EF	-.519	.426	-.362	-1.220	.228
	Adolescent CB X Adolescent EF	-.365	.359	-.181	-1.016	.315
	Adolescent SS X Parent EF	.152	.338	.128	.449	.655
	Adolescent SS X Adolescent EF	.419	.432	.184	.971	.336
	Parent EF X Adolescent EF	-.900	.391	-.436	-2.299	.026
	Par CB X Par SS X Adolescent CB	-.740	.398	-.435	-1.857	.069
	Par CB X Par SS X Adolescent SS	.962	.386	.542	2.494	.016
	Par CB X Par SS X Par EF	.260	.354	.182	.735	.466
	Par CB X Par SS X Adolescent EF	-.007	.285	-.011	-.025	.980
	Par CB X Adol CB X Adol SS	-.207	.446	-.258	-.464	.644
	Par CB X Adol CB X Par EF	-.244	.616	-.240	-.396	.694

	Par CB X Adol CB X Adol EF	.172	.456	.123	.378	.707
	Par CB X Adol SS X Par EF	-.364	.502	-.391	-.726	.471
	Par CB X Adol SS X Adol EF	.693	.444	.414	1.559	.125
	Par CB X Par EF X Adol EF	-.268	.324	-.277	-.828	.412
	Par SS X Adol CB X Adol SS	-.126	.294	-.123	-.430	.669
	Par SS X Adol CB X Par EF	-.075	.458	-.051	-.163	.871
	Par SS X Adol SS X Par EF	-.285	.509	-.185	-.560	.578
	Par SS X Adol SS X Adol EF	.029	.503	.013	.057	.955
	Par SS X Adol EF X Par EF	.108	.452	.084	.239	.812
	Adol CB X Adol SS X Par EF	.438	.325	.957	1.350	.183
	Adol CB X Adol SS X Adol EF	-.276	.440	-.167	-.628	.533
	Adol CB X Par EF X Adol EF	-.845	.578	-.410	-1.463	.150
	Adol SS X Par EF X Adol EF	-.123	.708	-.054	-.173	.863
5	(Constant)	13.085	2.886		4.535	.000
	Age	-.181	.151	-.161	-1.193	.241
	Gender	-.087	.481	-.026	-.180	.858
	Income	-.370	.190	-.295	-1.946	.060
	Ethnicity	-.039	.237	-.028	-.165	.870
	Parent EF	-1.292	.490	-.770	-2.637	.012
	Adolescent EF	-.760	.586	-.448	-1.297	.203
	Parent Cost-Benefit	.857	.549	.520	1.560	.128
	Parent Severity Susceptibility	.284	.485	.166	.585	.562
	Adolescent Cost-Benefit	.103	.405	.061	.255	.800
	Adolescent Severity Susceptibility	.252	.404	.152	.624	.537
	Parent CB X Parent SS	.986	.793	.656	1.243	.222
	Parent CB X Adolescent CB	.180	.702	.107	.256	.800
	Parent CB X Adolescent SS	-.887	.745	-.515	-1.191	.242
	Parent CB X Parent EF	-.779	.920	-.640	-.846	.403
	Parent CB X Adolescent EF	-.148	.615	-.119	-.241	.811
	Parent SS X Adolescent CB	-.054	.653	-.030	-.082	.935
	Parent SS X Adolescent SS	.203	.583	.107	.349	.729
	Parent SS X Parent EF	.455	.746	.248	.609	.546
	Parent SS X Adolescent EF	-.320	.598	-.350	-.535	.596
	Adolescent CB X Adolescent SS	-.632	.491	-.635	-1.287	.206
	Adolescent CB X Parent EF	-.297	.624	-.207	-.475	.637
	Adolescent CB X Adolescent EF	-.470	.829	-.234	-.567	.574
	Adolescent SS X Parent EF	.261	.514	.221	.508	.615
	Adolescent SS X Adolescent EF	.682	.740	.299	.922	.363
	Parent EF X Adolescent EF	-1.270	.824	-.616	-1.542	.132
	Par CB X Par SS X Adolescent CB	-.443	.707	-.260	-.626	.535

Par CB X Par SS X Adolescent SS	1.486	.854	.837	1.739	.091
Par CB X Par SS X Par EF	-.290	.809	-.202	-.358	.723
Par CB X Par SS X Adolescent EF	-.375	.843	-.556	-.444	.659
Par CB X Adol CB X Adol SS	-.473	.865	-.591	-.547	.588
Par CB X Adol CB X Par EF	-.388	1.050	-.382	-.370	.714
Par CB X Adol CB X Adol EF	-.408	.918	-.291	-.445	.659
Par CB X Adol SS X Par EF	-.930	.951	-.999	-.978	.335
Par CB X Adol SS X Adol EF	2.230	1.141	1.332	1.955	.059
Par CB X Par EF X Adol EF	-.897	1.059	-.927	-.847	.403
Par SS X Adol CB X Adol SS	.365	.641	.356	.568	.573
Par SS X Adol CB X Par EF	.511	.837	.346	.611	.545
Par SS X Adol SS X Par EF	.201	.886	.131	.227	.822
Par SS X Adol SS X Adol EF	.337	.820	.152	.410	.684
Par SS X Adol EF X Par EF	.932	1.072	.729	.870	.390
Adol CB X Adol SS X Par EF	.352	.642	.769	.549	.587
Adol CB X Adol SS X Adol EF	.350	1.160	.211	.301	.765
Adol CB X Par EF X Adol EF	-.938	1.540	-.455	-.609	.546
Adol SS X Par EF X Adol EF	.081	1.165	.036	.069	.945
Par CB X Par SS X Adol CB X Adol SS	.132	.852	.161	.155	.878
Par CB X Par SS X Adol CB X Par EF	-.318	1.048	-.251	-.304	.763
Par CB X Par SS X Adol CB X Adol EF	.337	.873	.294	.386	.702
Par CB X Adol SS X Par SS X Par EF	.500	1.641	.399	.304	.763
Par CB X Adol SS X Par SS X Adol EF	.130	.867	.069	.150	.882
Par CB X Par SS X Par EF X Adol EF	1.337	.718	1.527	1.862	.071
Par CB X Adol CB X Adol SS X Par EF	1.333	1.206	3.715	1.106	.276
Par CB X Adol SS X Adol CB X Adol EF	.101	1.074	.081	.094	.925
Par CB X Adol CB X Par EF X Adol EF	-.282	1.221	-.307	-.231	.819
Par CB X Adol SS X Par EF X Adol EF	.864	1.808	.697	.478	.636
Par SS X Adol CB X Adol SS X Par EF	-.603	1.042	-1.239	-.579	.566
Par SS X Adol CB X Adol SS X Adol EF	-.549	.654	-.341	-.839	.407

	Par SS X Adol CB X Par EF X Adol EF	.323	.770	.190	.419	.678
	Par SS X Adol SS X Par EF X Adol EF	-.911	1.598	-.352	-.570	.572
	Adol CB X Adol SS X Par EF X Adol EF	1.311	2.003	1.325	.655	.517
6	(Constant)	14.013	3.342		4.193	.000
	Age	-.278	.183	-.247	-1.515	.141
	Gender	.036	.524	.011	.069	.945
	Income	-.465	.243	-.371	-1.915	.065
	Ethnicity	.052	.264	.037	.195	.847
	Parent EF	-1.789	.633	-1.067	-2.828	.008
	Adolescent EF	-.759	.745	-.447	-1.018	.317
	Parent Cost-Benefit	.952	.738	.578	1.291	.207
	Parent Severity Susceptibility	.479	.615	.281	.779	.442
	Adolescent Cost-Benefit	.196	.448	.116	.437	.665
	Adolescent Severity Susceptibility	.124	.547	.074	.226	.823
	Parent CB X Parent SS	1.258	1.280	.837	.983	.334
	Parent CB X Adolescent CB	.344	.799	.206	.430	.670
	Parent CB X Adolescent SS	-.487	1.048	-.283	-.465	.645
	Parent CB X Parent EF	-1.527	1.375	-1.255	-1.111	.276
	Parent CB X Adolescent EF	-.473	.713	-.380	-.663	.512
	Parent SS X Adolescent CB	.004	.874	.002	.004	.997
	Parent SS X Adolescent SS	.293	.951	.154	.308	.760
	Parent SS X Parent EF	.651	1.231	.355	.529	.601
	Parent SS X Adolescent EF	-.301	.709	-.329	-.425	.674
	Adolescent CB X Adolescent SS	-.418	.599	-.420	-.698	.491
	Adolescent CB X Parent EF	.042	.675	.029	.062	.951
	Adolescent CB X Adolescent EF	-.530	.923	-.263	-.574	.571
	Adolescent SS X Parent EF	-.175	.666	-.148	-.263	.794
	Adolescent SS X Adolescent EF	.888	.919	.389	.966	.342
	Parent EF X Adolescent EF	-1.854	1.157	-.899	-1.602	.120
	Par CB X Par SS X Adolescent CB	-.254	1.773	-.150	-.144	.887
	Par CB X Par SS X Adolescent SS	.944	1.142	.532	.827	.415
	Par CB X Par SS X Par EF	-.626	1.745	-.437	-.359	.722
	Par CB X Par SS X Adolescent EF	-.416	1.019	-.617	-.408	.686
	Par CB X Adol CB X Adol SS	-.743	.938	-.928	-.793	.434
	Par CB X Adol CB X Par EF	.278	1.785	.274	.156	.877
	Par CB X Adol CB X Adol EF	.447	1.133	.319	.394	.696

Par CB X Adol SS X Par EF	-.190	1.426	-.204	-.134	.895
Par CB X Adol SS X Adol EF	1.502	1.572	.897	.956	.347
Par CB X Par EF X Adol EF	-2.008	1.742	-2.074	-1.153	.258
Par SS X Adol CB X Adol SS	-.537	.852	-.524	-.630	.534
Par SS X Adol CB X Par EF	.739	1.065	.501	.694	.493
Par SS X Adol SS X Par EF	-.069	1.637	-.045	-.042	.966
Par SS X Adol SS X Adol EF	.175	1.380	.079	.127	.900
Par SS X Adol EF X Par EF	1.557	1.235	1.219	1.261	.217
Adol CB X Adol SS X Par EF	1.438	.992	3.140	1.450	.158
Adol CB X Adol SS X Adol EF	-1.026	1.537	-.621	-.668	.510
Adol CB X Par EF X Adol EF	-.759	1.764	-.369	-.431	.670
Adol SS X Par EF X Adol EF	.010	1.849	.004	.005	.996
Par CB X Par SS X Adol CB X Adol SS	1.570	2.007	1.921	.783	.440
Par CB X Par SS X Adol CB X Par EF	-.058	1.597	-.045	-.036	.971
Par CB X Par SS X Adol CB X Adol EF	1.201	1.279	1.047	.939	.356
Par CB X Adol SS X Par SS X Par EF	-.149	1.993	-.119	-.075	.941
Par CB X Adol SS X Par SS X Adol EF	.040	1.488	.021	.027	.979
Par CB X Par SS X Par EF X Adol EF	2.525	1.128	2.885	2.239	.033
Par CB X Adol CB X Adol SS X Par EF	1.670	1.729	4.654	.966	.342
Par CB X Adol SS X Adol CB X Adol EF	.282	1.568	.226	.180	.859
Par CB X Adol CB X Par EF X Adol EF	.749	1.688	.816	.444	.660
Par CB X Adol SS X Par EF X Adol EF	-1.886	3.285	-1.521	-.574	.570
Par SS X Adol CB X Adol SS X Par EF	-1.859	1.515	-3.818	-1.227	.230
Par SS X Adol CB X Adol SS X Adol EF	-.208	1.871	-.129	-.111	.912
Par SS X Adol CB X Par EF X Adol EF	.460	1.096	.271	.420	.678
Par SS X Adol SS X Par EF X Adol EF	-1.211	3.230	-.468	-.375	.710
Adol CB X Adol SS X Par EF X Adol EF	-.113	2.489	-.114	-.045	.964
Par CB X Par SS X Adol CB X Adol SS X Par EF	1.892	2.462	4.916	.768	.448

Par CB X Par SS X Adol CB X Adol SS X Adol EF	-.684	1.648	-.551	-.415	.681
Par CB X Par SS X Adol CB X Par EF X Adol EF	-.862	2.446	-.644	-.352	.727
Par CB X Par SS X Adol SS X Par EF X Adol EF	-.066	4.643	-.034	-.014	.989
Par CB X Adol CB X Adol SS X Par EF X Adol EF	3.171	2.748	4.718	1.154	.258
Par SS X Adol SS X Par EF X Adol EF	.390	3.242	.375	.120	.905

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.593*	.002	.463[a]	.215	.215	5.810*	.000
Model 2	4.042*	.000	.555[b]	.308	.093	1.770	.116
Model 3	1.762	.034	.715[c]	.511	.203	3.235*	.002
Model 4	1.845*	.018	.793[d]	.628	.117	1.156	.333
Model 5	1.315	.193	.849[e]	.721	.093	.973	.495
Model 6	1.178	.319	.858[f]	.737	.016	.348	.906

Table 21.
Follow up regression results for Parent Cost-Benefit X Parent Severity Susceptibility X Adolescent Severity Susceptibility predicting HbA1c

		B	Std Error	Beta	t	Sig.
1	(Constant)	13.589	1.852		7.337	.000
	Ethnicity	-.416	.139	-.296	-2.984*	.004
	Income	-.271	.126	-.216	-2.152*	.034
	Age	-.099	.111	-.088	-.893	.374
	Gender	.076	.331	.023	.230	.818
2	(Constant)	14.367	1.802		7.973	.000
	Ethnicity	-.466	.144	-.332	-3.234*	.002
	Income	-.209	.122	-.167	-1.712	.090
	Age	-.147	.106	-.131	-1.382	.171
	Gender	.089	.318	.026	.281	.779
	Parent Cost-Benefit	-.037	.172	-.022	-.214	.831
	Parent Severity Susceptibility	.501	.175	.294	2.867	.005
	Adolescent Severity Susceptibility	.185	.162	.111	1.142	.257
3	(Constant)	13.903	1.859		7.480	.000
	Ethnicity	-.438	.147	-.311	-2.975*	.004
	Income	-.202	.123	-.162	-1.646	.103
	Age	-.127	.108	-.113	-1.173	.244
	Gender	.072	.320	.021	.225	.823
	Parent Cost-Benefit	-.015	.177	-.009	-.086	.932
	Parent Severity Susceptibility	.511	.183	.299	2.784*	.007
	Adolescent Severity Susceptibility	.142	.168	.085	.846	.400
	Parent CB X Parent SS	-.077	.147	-.052	-.526	.600
	Parent CB X Adolescent SS	.174	.171	.101	1.013	.314
4	(Constant)	14.064	1.846		7.617	.000
	Ethnicity	-.401	.148	-.285	-2.709*	.008
	Income	-.241	.125	-.192	-1.934	.056
	Age	-.144	.108	-.128	-1.335	.185
	Gender	.093	.318	.027	.293	.771
	Parent Cost-Benefit	-.004	.175	-.003	-.025	.980
	Parent Severity Susceptibility	.496	.182	.291	2.724*	.008
	Adolescent Severity Susceptibility	.045	.178	.027	.255	.800
	Parent CB X Parent SS	-.059	.146	-.039	-.401	.689
	Parent CB X Adolescent SS	.344	.203	.200	1.700	.093
	Par CB X Par SS X Adol SS	.325	.210	.183	1.547	.126

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.593*	.002	.412	.170	.170	4.593*	.002
Model 2	4.584*	.000	.519	.219	.100	3.967*	.001
Model 3	3.683*	.001	.530	.281	.011	.655	.522
Model 4	3.608*	.001	.548	.300	.020	2.393	.126

* indicates significance at $p < .05$

Table 22.
Follow up regression results for Parent Executive Functioning X Adolescent Executive Functioning predicting HbA1c

		B	Std. Error	Beta	t	Sig.
1	(Constant)	13.589	1.852		7.337	.000
	Ethnicity	-.416	.139	-.296	-2.984	.004
	Income	-.271	.126	-.216	-2.152	.034
	Age	-.099	.111	-.088	-.893	.374
	Gender	.076	.331	.023	.230	.818
2	(Constant)	14.217	1.787		7.958	.000
	Ethnicity	-.428	.134	-.304	-3.183	.002
	Income	-.297	.121	-.237	-2.449	.016
	Age	-.126	.106	-.112	-1.184	.239
	Gender	.041	.318	.012	.128	.898
	Par Executive Functioning	-.219	.159	-.130	-1.379	.171
	Adol Executive Functioning	-.490	.159	-.288	-3.081	.003
3	(Constant)	13.865	1.764		7.859	.000
	Ethnicity	-.409	.132	-.291	-3.088	.003
	Income	-.278	.120	-.222	-2.326	.022
	Age	-.112	.105	-.100	-1.070	.287
	Gender	-.014	.314	-.004	-.044	.965
	Par Executive Functioning	-.190	.157	-.113	-1.214	.228
	Adol EF	-.462	.157	-.272	-2.949	.004
	Par EF X Adol EF	-.385	.190	-.187	-2.031	.045

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	4.593*	.002	.412	.170	.170	4.593*	.002
Model 2	5.097*	.000	.507	.257	.088	5.195*	.007
Model 3	5.097*	.000	.539	.291	.034	4.127	.045

* indicates significance at $p < .05$

Table 23.
Regression Results for Depressive Symptoms Moderation Model Predicting Adherence (SCI)

		B	Std. Error	Beta	t	Sig.
1	(Constant)	67.376	9.350		7.206	.000
	Age	-1.634	.561	-.286	-2.914	.005
	Gender	-1.448	1.680	-.084	-.862	.391
	Income	.605	.653	.092	.927	.357
	Ethnicity	2.172	.689	.311	3.152	.002
2	(Constant)	68.765	9.619		7.149	.000
	Age	-1.501	.556	-.263	-2.701	.008
	Gender	-1.511	1.703	-.088	-.887	.378
	Income	.304	.676	.046	.450	.654
	Ethnicity	1.787	.733	.256	2.437	.017
	Parent Cost-Benefit	-1.104	.879	-.134	-1.256	.213
	Parent Severity Susceptibility	-.476	.961	-.055	-.495	.622
	Adolescent Cost-Benefit	-1.162	.989	-.138	-1.175	.243
	Adol Severity Susceptibility	-.285	.995	-.033	-.287	.775
	Parent Depression	.022	.903	.003	.024	.981
	Adolescent Depression	-1.123	.929	-.130	-1.209	.230
3	(Constant)	70.172	9.344		7.510	.000
	Age	-1.372	.524	-.240	-2.617	.011
	Gender	-2.010	1.705	-.116	-1.179	.243
	Income	.115	.633	.018	.182	.856
	Ethnicity	1.367	.682	.196	2.005	.049
	Parent Cost-Benefit	-.699	1.011	-.085	-.691	.492
	Parent Severity Susceptibility	-.608	1.060	-.071	-.574	.568
	Adolescent Cost-Benefit	-.994	.924	-.118	-1.076	.286
	Adol Severity Susceptibility	.064	.964	.007	.066	.947
	Parent Depression	-.585	1.140	-.068	-.514	.609
	Adolescent Depression	-.293	1.028	-.034	-.285	.776
	Parent CB X Parent Depression	1.583	.809	.262	1.957	.054
	Parent CB X Adol Depression	-1.076	.872	-.142	-1.234	.221
	Parent SS X Parent Depression	-.971	1.169	-.188	-.830	.409
	Parent SS X Adol Depression	2.686	1.134	.349	2.368	.021
	Adolescent CB X Parent Dep	1.357	1.418	.105	.957	.342
	Adol CB X Adol Depression	-1.068	.994	-.138	-1.074	.286
	Adolescent SS X Parent Dep	5.073	1.599	.386	3.173	.002
	Adolescent SS X Adol Dep	.528	.925	.064	.570	.570
	Parent Dep X Adol Dep	-1.033	1.173	-.175	-.881	.381
4	(Constant)	59.643	11.416		5.225	.000
	Age	-.922	.586	-.162	-1.572	.122
	Gender	-1.148	1.965	-.067	-.584	.561
	Income	.032	.710	.005	.045	.964
	Ethnicity	1.786	.753	.256	2.372	.021
	Parent Cost-Benefit	.047	1.198	.006	.039	.969
	Parent Severity Susceptibility	-2.245	1.329	-.261	-1.689	.097
	Adolescent Cost-Benefit	.154	1.150	.018	.134	.894

	Adol Severity Susceptibility	-1.570	1.326	-.181	-1.184	.241
	Parent Depression	-1.628	1.446	-.190	-1.126	.265
	Adolescent Depression	.562	1.328	.065	.423	.674
	Parent CB X Parent Depression	.513	2.019	.085	.254	.800
	Parent CB X Adol Depression	.276	1.499	.036	.184	.855
	Parent SS X Parent Depression	-4.598	2.130	-.891	-2.158	.035
	Parent SS X Adol Depression	2.090	1.559	.272	1.340	.186
	Adolescent CB X Parent Dep	2.679	2.072	.208	1.293	.202
	Adol CB X Adol Depression	-2.786	1.459	-.359	-1.909	.061
	Adolescent SS X Parent Dep	1.326	2.222	.101	.597	.553
	Adolescent SS X Adol Dep	2.001	1.330	.244	1.505	.138
	Parent Dep X Adol Dep	-.417	1.740	-.071	-.239	.812
	Par CB X Par SS X Par Dep	1.720	1.314	.419	1.309	.196
	Par CB X Par SS X Adol Dep	-1.124	1.685	-.163	-.667	.508
	Par CB X Adol CB X Par Dep	.000	2.634	.000	.000	1.000
	Par CB X Adol CB X Adol Dep	.753	1.768	.118	.426	.672
	Par CB X Adol SS X Par Dep	-.784	3.267	-.058	-.240	.811
	Par CB X Adol SS X Adol Dep	-2.717	1.835	-.335	-1.481	.144
	Par CB X Par Dep X Adol Dep	-1.428	2.924	-.204	-.489	.627
	Par SS X Adol CB X Par Dep	.089	2.241	.008	.040	.968
	Par SS X Adol SS X Par Dep	-.639	2.973	-.066	-.215	.831
	ParSS X Adol SS X Adol Dep	.056	1.380	.006	.041	.968
	Par SS X Adol Dep X Par Dep	2.197	1.187	.841	1.850	.070
	Adol CB X Adol SS X Par Dep	.863	2.154	.073	.400	.690
	Adol CB X Adol SS X Adol Dep	.033	.901	.008	.037	.971
	Adol CB X Par Dep X Adol Dep	-4.009	2.387	-.377	-1.680	.099
	Adol SS X Par Dep X Adol Dep	1.742	2.065	.190	.843	.403
5	(Constant)	59.260	12.242		4.841	.000
	Age	-.718	.625	-.126	-1.148	.258
	Gender	-1.785	2.077	-.103	-.860	.395
	Income	-.961	.828	-.147	-1.160	.253
	Ethnicity	2.146	.919	.307	2.335	.025
	Parent Cost-Benefit	.456	1.833	.055	.249	.805
	Parent Severity Susceptibility	-1.548	1.832	-.180	-.845	.403
	Adolescent Cost-Benefit	-.916	1.793	-.109	-.511	.612
	Adol Severity Susceptibility	-2.480	1.732	-.286	-1.432	.160
	Parent Depression	-1.839	1.737	-.214	-1.059	.296
	Adolescent Depression	1.531	1.903	.177	.804	.426
	Parent CB X Parent Depression	1.692	2.873	.280	.589	.559
	Parent CB X Adol Depression	-.391	2.366	-.052	-.165	.870
	Parent SS X Parent Depression	-3.912	2.658	-.758	-1.472	.149
	Parent SS X Adol Depression	5.607	2.559	.729	2.191	.034
	Adolescent CB X Parent Dep	3.994	2.835	.310	1.409	.166
	Adol CB X Adol Depression	-1.845	1.954	-.238	-.944	.351
	Adolescent SS X Parent Dep	2.944	3.926	.224	.750	.458
	Adolescent SS X Adol Dep	-.224	2.408	-.027	-.093	.926

	Parent Dep X Adol Dep	-1.694	2.501	-.287	-.677	.502
	Par CB X Par SS X Par Dep	1.789	2.148	.436	.833	.410
	Par CB X Par SS X Adol Dep	-.732	2.694	-.106	-.272	.787
	Par CB X Adol CB X Par Dep	-1.805	4.212	-.131	-.429	.670
	Par CB X Adol CB X Adol Dep	2.229	3.171	.350	.703	.486
	Par CB X Adol SS X Par Dep	-4.795	3.735	-.355	-1.284	.206
	Par CB X Adol SS X Adol Dep	-1.746	3.470	-.216	-.503	.617
	Par CB X Par Dep X Adol Dep	.819	5.207	.117	.157	.876
	Par SS X Adol CB X Par Dep	1.332	3.320	.117	.401	.690
	Par SS X Adol SS X Par Dep	4.797	4.640	.498	1.034	.307
	ParSS X Adol SS X Adol Dep	-3.464	3.577	-.358	-.968	.339
	Par SS X Adol Dep X Par Dep	2.379	3.200	.911	.743	.461
	Adol CB X Adol SS X Par Dep	-5.146	4.374	-.435	-1.177	.246
	Adol CB X Adol SS X Adol Dep	1.767	2.064	.411	.856	.397
	Adol CB X Par Dep X Adol Dep	.224	3.217	.021	.070	.945
	Adol SS X Par Dep X Adol Dep	-.694	4.184	-.076	-.166	.869
	Par CB X Par SS X Adol CB X Par Dep	1.821	4.491	.172	.405	.687
	Par CB X Par SS X Adol CB X Adol Dep	1.235	3.940	.148	.313	.756
	Par CB X Adol SS X Par SS X Par Dep	-.576	3.836	-.054	-.150	.881
	Par CB X Adol SS X Par SS X Adol Dep	-1.767	3.965	-.169	-.446	.658
	Par CB X Par SS X Par Dep X Adol Dep	.549	3.607	.176	.152	.880
	Par CB X Adol CB X Adol SS X Par Dep	5.200	4.926	.456	1.056	.297
	Par CB X Adol SS X Adol CB X Adol Dep	-3.322	2.182	-.832	-1.522	.136
	Par CB X Adol CB X Par Dep X Adol Dep	2.705	5.931	.206	.456	.651
	Par CB X Adol SS X Par Dep X Adol Dep	-2.371	5.508	-.187	-.431	.669
	Par SS X Adol CB X Adol SS X Par Dep	-7.341	5.063	-.617	-1.450	.155
	Par SS X Adol CB X Adol SS X Adol Dep	-1.038	1.958	-.206	-.530	.599
	Par SS X Adol CB X Par Dep X Adol Dep	3.054	3.854	.416	.792	.433
	Par SS X Adol SS X Par Dep X Adol Dep	-2.742	4.139	-.529	-.663	.511
	Adol CB X Adol SS X Par Dep X Adol Dep	2.398	3.912	.269	.613	.543
6	(Constant)	56.837	14.815		3.836	.000
	Age	-.525	.717	-.092	-.732	.469

Gender	-1.677	2.298	-.097	-.729	.471
Income	-.800	.897	-.122	-.891	.379
Ethnicity	1.949	1.175	.279	1.658	.106
Parent Cost-Benefit	1.119	2.155	.135	.519	.607
Parent Severity Susceptibility	-1.248	2.351	-.145	-.531	.599
Adolescent Cost-Benefit	-.431	2.137	-.051	-.202	.841
Adol Severity Susceptibility	-3.518	2.579	-.405	-1.364	.181
Parent Depression	-2.417	2.126	-.282	-1.137	.263
Adolescent Depression	1.501	2.166	.173	.693	.493
Parent CB X Parent Depression	3.109	3.493	.515	.890	.380
Parent CB X Adol Depression	.763	3.274	.101	.233	.817
Parent SS X Parent Depression	-4.850	3.360	-.940	-1.443	.158
Parent SS X Adol Depression	6.111	2.947	.794	2.074	.046
Adolescent CB X Parent Dep	6.438	3.697	.500	1.741	.090
Adol CB X Adol Depression	-1.747	2.991	-.225	-.584	.563
Adolescent SS X Parent Dep	.474	5.942	.036	.080	.937
Adolescent SS X Adol Dep	.584	3.457	.071	.169	.867
Parent Dep X Adol Dep	-2.487	2.985	-.422	-.833	.411
Par CB X Par SS X Par Dep	2.638	2.861	.643	.922	.363
Par CB X Par SS X Adol Dep	-.165	3.480	-.024	-.048	.962
Par CB X Adol CB X Par Dep	-5.112	5.559	-.372	-.920	.364
Par CB X Adol CB X Adol Dep	1.999	3.693	.314	.541	.592
Par CB X Adol SS X Par Dep	-4.899	4.050	-.362	-1.210	.235
Par CB X Adol SS X Adol Dep	-3.560	4.779	-.440	-.745	.461
Par CB X Par Dep X Adol Dep	2.332	6.759	.333	.345	.732
Par SS X Adol CB X Par Dep	1.280	4.672	.113	.274	.786
Par SS X Adol SS X Par Dep	3.691	5.242	.383	.704	.486
ParSS X Adol SS X Adol Dep	-1.886	4.806	-.195	-.393	.697
Par SS X Adol Dep X Par Dep	.294	4.032	.112	.073	.942
Adol CB X Adol SS X Par Dep	-2.158	6.129	-.182	-.352	.727
Adol CB X Adol SS X Adol Dep	-.576	2.982	-.134	-.193	.848
Adol CB X Par Dep X Adol Dep	1.801	4.366	.169	.413	.682
Adol SS X Par Dep X Adol Dep	-.194	4.755	-.021	-.041	.968
Par CB X Par SS X Adol CB X Par Dep	.530	8.108	.050	.065	.948
Par CB X Par SS X Adol CB X Adol Dep	4.089	5.605	.491	.730	.471
Par CB X Adol SS X Par SS X Par Dep	-3.626	5.434	-.340	-.667	.509
Par CB X Adol SS X Par SS X Adol Dep	-6.521	6.880	-.625	-.948	.350
Par CB X Par SS X Par Dep X Adol Dep	1.060	4.276	.339	.248	.806
Par CB X Adol CB X Adol SS X Par Dep	1.468	8.626	.129	.170	.866

Par CB X Adol SS X Adol CB X Adol Dep	-1.465	4.622	-.367	-.317	.753
Par CB X Adol CB X Par Dep X Adol Dep	-1.057	8.124	-.081	-.130	.897
Par CB X Adol SS X Par Dep X Adol Dep	-1.983	7.297	-.156	-.272	.787
Par SS X Adol CB X Adol SS X Par Dep	-7.918	6.566	-.665	-1.206	.236
Par SS X Adol CB X Adol SS X Adol Dep	-4.471	4.921	-.887	-.909	.370
Par SS X Adol CB X Par Dep X Adol Dep	2.547	4.689	.347	.543	.590
Par SS X Adol SS X Par Dep X Adol Dep	-4.691	5.529	-.905	-.849	.402
Adol CB X Adol SS X Par Dep X Adol Dep	1.595	4.996	.179	.319	.751
Par CB X Par SS X Adol CB X Adol SS X Par Dep	-5.286	8.984	-.509	-.588	.560
Par CB X Par SS X Adol CB X Adol SS X Adol Dep	4.557	5.219	1.039	.873	.389
Par CB X Par SS X Adol CB X Par Dep X Adol Dep	5.925	8.531	.782	.695	.492
Par CB X Par SS X Adol SS X Par Dep X Adol Dep	-17.773	16.466	-2.410	-1.079	.288
Par CB X Adol CB X Adol SS X Par Dep X Adol Dep	2.067	8.574	.178	.241	.811
Par SS X Adol CB X Adol SS X Par Dep X Adol Dep	-8.438	9.193	-.851	-.918	.365

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	5.810*	.000	.158	-.025	.025	.500	.736
Model 2	3.512*	.001	.318	-.101	.076	1.016	.422
Model 3	3.852*	.000	.431	-.186	.085	.727	.682
Model 4	2.734*	.000	.499	.249	.063	.268	.996
Model 5	2.207*	.005	.698	.487	.238	1.128	.370
Model 6	1.814	.032	.726	.527	.040	.392	.878

* Indicates significance of $p < .01$ (based on Holm Bonferroni correction)

Table 24.
Regression Results for Depressive Symptoms Moderation Model Predicting Blood Glucose Monitoring

		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.728	2.986		2.253	.027
	Age	-.178	.177	-.114	-1.002	.319
	Gender	.286	.540	.060	.529	.598
	Income	.208	.213	.116	.976	.332
	Ethnicity	-.123	.253	-.057	-.487	.627
	(Constant)	7.456	3.177		2.347	.022
	Age	-.162	.180	-.104	-.897	.373
	Gender	.131	.570	.027	.230	.819
	Income	.105	.229	.058	.457	.649
	Ethnicity	-.188	.284	-.087	-.665	.508
	Parent Cost-Benefit	.093	.327	.038	.286	.776
	Parent Severity Susceptibility	-.444	.325	-.192	-1.369	.175
	Adolescent Cost-Benefit	-.563	.331	-.240	-1.699	.094
	Adol Severity Susceptibility	.146	.336	.062	.435	.665
	Parent Depression	.247	.293	.107	.844	.401
	Adolescent Depression	.013	.327	.005	.041	.967
2	(Constant)	8.883	3.645		2.437	.018
	Age	-.229	.195	-.148	-1.177	.244
	Gender	.298	.638	.062	.468	.642
	Income	.105	.239	.058	.439	.662
	Ethnicity	-.306	.307	-.141	-.995	.324
	Parent Cost-Benefit	-.265	.416	-.107	-.637	.526
	Parent Severity Susceptibility	-.230	.400	-.099	-.574	.568
	Adolescent Cost-Benefit	-.573	.357	-.245	-1.603	.114
	Adol Severity Susceptibility	.004	.397	.002	.010	.992
	Parent Depression	.572	.430	.247	1.332	.188
	Adolescent Depression	.299	.452	.122	.662	.510
	Parent CB X Parent Depression	.525	.323	.325	1.629	.108
	Parent CB X Adol Depression	-.155	.528	-.050	-.293	.770
	Parent SS X Parent Depression	-.836	.519	-.604	-1.612	.112
	Parent SS X Adol Depression	.295	.430	.140	.686	.495
	Adolescent CB X Parent Dep	.477	.548	.136	.870	.387
	Adol CB X Adol Depression	-.282	.364	-.131	-.774	.442

Adolescent SS X Parent Dep	-.394	.672	-.111	-.587	.560
Adolescent SS X Adol Dep	.315	.369	.140	.854	.396
Parent Dep X Adol Dep	.496	.526	.312	.944	.349
(Constant)	7.595	4.722		1.609	.114
Age	-.169	.246	-.109	-.689	.494
Gender	.265	.840	.055	.316	.753
Income	.058	.302	.032	.192	.848
Ethnicity	-.231	.372	-.107	-.621	.537
Parent Cost-Benefit	-.194	.597	-.078	-.325	.747
Parent Severity Susceptibility	-.324	.573	-.140	-.565	.575
Adolescent Cost-Benefit	-.390	.511	-.167	-.762	.450
Adol Severity Susceptibility	-.067	.585	-.028	-.115	.909
Parent Depression	.521	.610	.225	.854	.397
Adolescent Depression	.338	.634	.138	.534	.596
Parent CB X Parent Depression	.014	.854	.008	.016	.987
Parent CB X Adol Depression	.138	.709	.044	.195	.846
Parent SS X Parent Depression	-1.053	.882	-.762	-1.194	.238
Parent SS X Adol Depression	.409	.784	.194	.522	.604
Adolescent CB X Parent Dep	.742	.885	.211	.838	.406
Adol CB X Adol Depression	-.460	.694	-.214	-.663	.511
Adolescent SS X Parent Dep	-.909	1.029	-.255	-.883	.382
Adolescent SS X Adol Dep	.366	.637	.163	.574	.568
Parent Dep X Adol Dep	.311	.861	.196	.361	.719
Par CB X Par SS X Par Dep	.155	.558	.142	.278	.782
Par CB X Par SS X Adol Dep	.014	.896	.007	.015	.988
Par CB X Adol CB X Par Dep	.459	1.200	.120	.382	.704
Par CB X Adol CB X Adol Dep	-.882	.900	-.321	-.980	.332
Par CB X Adol SS X Par Dep	.090	1.467	.024	.061	.951
Par CB X Adol SS X Adol Dep	.047	.769	.016	.061	.952
Par CB X Par Dep X Adol Dep	-.971	1.274	-.503	-.762	.450
Par SS X Adol CB X Par Dep	-.398	.993	-.131	-.401	.690
Par SS X Adol SS X Par Dep	.624	1.423	.242	.439	.663
ParSS X Adol SS X Adol Dep	-.408	.663	-.156	-.616	.541
Par SS X Adol Dep X Par Dep	-.140	.538	-.201	-.261	.795
Adol CB X Adol SS X Par Dep	.098	.939	.031	.104	.918
Adol CB X Adol SS X Adol Dep	.224	.452	.194	.496	.622

Adol CB X Par Dep X Adol Dep	-.031	1.224	-.011	-.025	.980
Adol SS X Par Dep X Adol Dep	.118	1.209	.047	.098	.923
(Constant)	6.122	5.288		1.158	.255
Age	-.074	.258	-.048	-.288	.775
Gender	.102	.914	.021	.112	.912
Income	-.128	.343	-.071	-.373	.712
Ethnicity	-.056	.439	-.026	-.126	.900
Parent Cost-Benefit	1.588	.951	.643	1.670	.104
Parent Severity Susceptibility	.070	.857	.030	.082	.935
Adolescent Cost-Benefit	.290	.956	.124	.304	.763
Adol Severity Susceptibility	-1.162	.835	-.490	-1.391	.173
Parent Depression	.459	.762	.198	.603	.551
Adolescent Depression	.829	.791	.337	1.047	.302
Parent CB X Parent Depression	.456	1.329	.282	.343	.733
Parent CB X Adol Depression	1.103	1.070	.355	1.031	.310
Parent SS X Parent Depression	-.312	1.163	-.226	-.269	.790
Parent SS X Adol Depression	.984	1.369	.467	.719	.477
Adolescent CB X Parent Dep	1.227	1.454	.349	.844	.404
Adol CB X Adol Depression	.451	1.054	.210	.428	.672
Adolescent SS X Parent Dep	-2.380	1.961	-.668	-1.214	.233
Adolescent SS X Adol Dep	1.580	1.109	.704	1.425	.163
Parent Dep X Adol Dep	-.285	1.058	-.179	-.270	.789
Par CB X Par SS X Par Dep	1.308	.919	1.198	1.424	.164
Par CB X Par SS X Adol Dep	-1.874	1.453	-.985	-1.289	.206
Par CB X Adol CB X Par Dep	-1.141	2.106	-.299	-.542	.591
Par CB X Adol CB X Adol Dep	.784	1.513	.285	.518	.607
Par CB X Adol SS X Par Dep	-2.244	1.670	-.607	-1.344	.188
Par CB X Adol SS X Adol Dep	-2.587	1.700	-.896	-1.522	.137
Par CB X Par Dep X Adol Dep	-.209	2.185	-.108	-.096	.924
Par SS X Adol CB X Par Dep	-.808	1.402	-.266	-.577	.568
Par SS X Adol SS X Par Dep	3.012	1.942	1.169	1.551	.130
ParSS X Adol SS X Adol Dep	-.191	1.957	-.073	-.098	.923
Par SS X Adol Dep X Par Dep	1.045	1.956	1.499	.534	.597
Adol CB X Adol SS X Par Dep	-2.737	2.432	-.860	-1.125	.268
Adol CB X Adol SS X Adol Dep	-.151	1.095	-.130	-.138	.891

Adol CB X Par Dep X Adol Dep	1.774	1.835	.607	.967	.341
Adol SS X Par Dep X Adol Dep	-1.769	2.021	-.709	-.875	.388
Par CB X Par SS X Adol CB X Par Dep	2.759	1.867	.969	1.478	.149
Par CB X Par SS X Adol CB X Adol Dep	2.020	2.025	.822	.998	.326
Par CB X Adol SS X Par SS X Par Dep	.898	1.701	.315	.528	.601
Par CB X Adol SS X Par SS X Adol Dep	-4.299	1.819	-1.446	-2.364	.024
Par CB X Par SS X Par Dep X Adol Dep	2.594	1.900	3.113	1.365	.181
Par CB X Adol CB X Adol SS X Par Dep	1.133	2.224	.368	.510	.614
Par CB X Adol SS X Adol CB X Adol Dep	-2.585	1.081	-2.254	-2.392	.022
Par CB X Adol CB X Par Dep X Adol Dep	-1.258	2.745	-.324	-.458	.650
Par CB X Adol SS X Par Dep X Adol Dep	-3.977	2.944	-1.124	-1.351	.186
Par SS X Adol CB X Adol SS X Par Dep	.301	2.375	.095	.127	.900
Par SS X Adol CB X Adol SS X Adol Dep	-1.614	.921	-1.197	-1.754	.089
Par SS X Adol CB X Par Dep X Adol Dep	.682	1.780	.347	.383	.704
Par SS X Adol SS X Par Dep X Adol Dep	-.629	2.371	-.454	-.266	.792
Adol CB X Adol SS X Par Dep X Adol Dep	.223	1.980	.093	.112	.911
(Constant)	1.517	6.473		.234	.816
Age	.070	.298	.045	.234	.817
Gender	.547	1.045	.114	.523	.605
Income	.004	.407	.002	.009	.993
Ethnicity	.170	.541	.078	.315	.755
Parent Cost-Benefit	1.289	1.255	.522	1.028	.313
Parent Severity Susceptibility	-.515	1.087	-.223	-.474	.639
Adolescent Cost-Benefit	.317	1.137	.135	.279	.782
Adol Severity Susceptibility	-1.545	1.168	-.652	-1.323	.197
Parent Depression	.274	.984	.118	.279	.783
Adolescent Depression	.351	.961	.143	.365	.718
Parent CB X Parent Depression	-.181	1.922	-.112	-.094	.926

Parent CB X Adol Depression	.104	1.819	.033	.057	.955
Parent SS X Parent Depression	-1.325	1.549	-.958	-.855	.400
Parent SS X Adol Depression	.745	1.543	.353	.483	.633
Adolescent CB X Parent Dep	.852	2.290	.242	.372	.713
Adol CB X Adol Depression	-.157	1.368	-.073	-.115	.910
Adolescent SS X Parent Dep	-3.725	2.758	-1.046	-1.351	.188
Adolescent SS X Adol Dep	2.339	1.635	1.042	1.430	.164
Parent Dep X Adol Dep	-.223	1.534	-.140	-.146	.885
Par CB X Par SS X Par Dep	.563	1.312	.515	.429	.671
Par CB X Par SS X Adol Dep	-2.543	2.072	-1.336	-1.227	.230
Par CB X Adol CB X Par Dep	.543	3.667	.142	.148	.883
Par CB X Adol CB X Adol Dep	-.003	2.148	-.001	-.001	.999
Par CB X Adol SS X Par Dep	-1.488	1.937	-.402	-.768	.449
Par CB X Adol SS X Adol Dep	-2.590	2.282	-.897	-1.135	.266
Par CB X Par Dep X Adol Dep	-.956	3.060	-.496	-.313	.757
Par SS X Adol CB X Par Dep	-3.040	2.537	-1.000	-1.198	.241
Par SS X Adol SS X Par Dep	1.594	2.416	.619	.660	.515
ParSS X Adol SS X Adol Dep	1.496	2.555	.572	.585	.563
Par SS X Adol Dep X Par Dep	.035	2.640	.050	.013	.990
Adol CB X Adol SS X Par Dep	1.230	3.865	.386	.318	.753
Adol CB X Adol SS X Adol Dep	-1.010	1.861	-.873	-.543	.592
Adol CB X Par Dep X Adol Dep	1.377	2.179	.471	.632	.533
Adol SS X Par Dep X Adol Dep	-1.508	2.568	-.604	-.587	.562
Par CB X Par SS X Adol CB X Par Dep	-.709	3.570	-.249	-.199	.844
Par CB X Par SS X Adol CB X Adol Dep	1.490	3.240	.606	.460	.649
Par CB X Adol SS X Par SS X Par Dep	1.395	2.737	.489	.510	.614
Par CB X Adol SS X Par SS X Adol Dep	-4.784	3.512	-1.609	-1.362	.184
Par CB X Par SS X Par Dep X Adol Dep	.377	2.818	.453	.134	.895
Par CB X Adol CB X Adol SS X Par Dep	.378	4.155	.123	.091	.928
Par CB X Adol SS X Adol CB X Adol Dep	1.153	3.118	1.005	.370	.714
Par CB X Adol CB X Par Dep X Adol Dep	-.762	4.110	-.196	-.185	.854

Par CB X Adol SS X Par Dep X Adol Dep	-3.258	3.854	-.921	-.846	.405
Par SS X Adol CB X Adol SS X Par Dep	1.882	4.240	.592	.444	.661
Par SS X Adol CB X Adol SS X Adol Dep	-2.409	2.619	-1.786	-.920	.365
Par SS X Adol CB X Par Dep X Adol Dep	.113	2.251	.057	.050	.960
Par SS X Adol SS X Par Dep X Adol Dep	-1.851	3.356	-1.337	-.552	.586
Adol CB X Adol SS X Par Dep X Adol Dep	.169	2.658	.070	.064	.950
Par CB X Par SS X Adol CB X Adol SS X Par Dep	-4.133	4.158	-1.486	-.994	.329
Par CB X Par SS X Adol CB X Adol SS X Adol Dep	3.904	3.405	3.297	1.147	.261
Par CB X Par SS X Adol CB X Par Dep X Adol Dep	-3.704	4.728	-1.824	-.783	.440
Par CB X Par SS X Adol SS X Par Dep X Adol Dep	-1.413	8.554	-.718	-.165	.870
Par CB X Adol CB X Adol SS X Par Dep X Adol Dep	3.433	3.984	1.047	.862	.396
Par SS X Adol CB X Adol SS X Par Dep X Adol Dep	-3.207	5.615	-1.207	-.571	.572

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig F Change
Model 1	.500	.736	.389	.151	.151	3.704*	.008
Model 2	.810	.620	.597	.357	.205	4.098*	.001
Model 3	.756	.746	.637	.406	.049	.629	.768
Model 4	.467	.989	.753	.566	.160	1.303	.234
Model 5	.672	.898	.838	.703	.136	1.278	.264
Model 6	.577	.958	.859	.739	.036	.757	.609

* Indicates significance of $p < .05$ (based on Holm Bonferroni correction)

Table 25.
Regression Results for Depressive Symptoms Moderation Model Predicting Metabolic Control (HbA1c)

		E	Std. Error	Beta	t	Sig.
1	(Constant)	13.797	1.860		7.417	.000
	Age	-.137	.111	-.128	-1.237	.220
	Gender	.107	.336	.032	.317	.752
	Income	-.185	.130	-.149	-1.421	.159
	Ethnicity	-.421	.141	-.308	-2.986	.004
2	(Constant)	13.944	1.777		7.845	.000
	Age	-.169	.102	-.157	-1.655	.102
	Gender	.121	.316	.037	.384	.702
	Income	-.070	.126	-.057	-.560	.577
	Ethnicity	-.438	.140	-.320	-3.129	.002
	Parent Cost-Benefit	-.083	.162	-.053	-.511	.611
	Parent Severity Susceptibility	.690	.179	.424	3.857	.000
	Adolescent Cost-Benefit	.221	.183	.138	1.207	.231
	Adol Severity Susceptibility	.115	.188	.070	.613	.542
	Parent Depression	-.418	.168	-.256	-2.496	.015
	Adolescent Depression	.084	.177	.051	.476	.635
3	(Constant)	14.478	1.980		7.310	.000
	Age	-.198	.110	-.184	-1.795	.077
	Gender	-.055	.363	-.017	-.151	.881
	Income	-.065	.135	-.053	-.484	.630
	Ethnicity	-.402	.148	-.294	-2.710	.009
	Parent Cost-Benefit	-.102	.214	-.066	-.477	.635
	Parent Severity Susceptibility	.779	.227	.479	3.439	.001
	Adolescent Cost-Benefit	.185	.196	.116	.946	.347
	Adol Severity Susceptibility	.246	.225	.150	1.094	.278
	Parent Depression	-.292	.246	-.179	-1.190	.238
	Adolescent Depression	.052	.251	.031	.209	.835
	Parent CB X Parent Depression	-.113	.183	-.099	-.616	.540
	Parent CB X Adol Depression	.078	.187	.055	.419	.677
	Parent SS X Parent Depression	.000	.290	.000	-.001	.999
	Parent SS X Adol Depression	-.050	.243	-.034	-.207	.837
	Adolescent CB X Parent Dep	.121	.308	.049	.393	.695
	Adol CB X Adol Depression	.097	.210	.066	.462	.646
	Adolescent SS X Parent Dep	.527	.380	.210	1.387	.170
	Adolescent SS X Adol Dep	-.212	.206	-.135	-1.025	.309
	Parent Dep X Adol Dep	-.200	.303	-.178	-.659	.512
4	(Constant)	15.705	2.370		6.625	.000
	Age	-.233	.124	-.216	-1.874	.066
	Gender	-.522	.414	-.159	-1.260	.213
	Income	.004	.147	.004	.030	.976
	Ethnicity	-.430	.163	-.314	-2.642	.011
	Parent Cost-Benefit	-.017	.251	-.011	-.066	.947

	Parent Severity Susceptibility	1.171	.276	.720	4.246	.000
	Adolescent Cost-Benefit	-.019	.241	-.012	-.080	.936
	Adol Severity Susceptibility	.509	.290	.310	1.756	.085
	Parent Depression	-.368	.308	-.226	-1.195	.237
	Adolescent Depression	.391	.311	.234	1.255	.215
	Parent CB X Parent Depression	-.360	.434	-.316	-.829	.411
	Parent CB X Adol Depression	.052	.313	.037	.168	.867
	Parent SS X Parent Depression	.868	.443	.891	1.961	.055
	Parent SS X Adol Depression	.107	.324	.073	.331	.742
	Adolescent CB X Parent Dep	-.146	.437	-.059	-.333	.740
	Adol CB X Adol Depression	.325	.335	.222	.969	.337
	Adolescent SS X Parent Dep	.961	.499	.384	1.927	.059
	Adolescent SS X Adol Dep	-.476	.304	-.304	-1.568	.123
	Parent Dep X Adol Dep	-.080	.435	-.071	-.183	.856
	Par CB X Par SS X Par Dep	.031	.282	.041	.111	.912
	Par CB X Par SS X Adol Dep	-.202	.354	-.155	-.571	.570
	Par CB X Adol CB X Par Dep	-.223	.594	-.086	-.376	.708
	Par CB X Adol CB X Adol Dep	-.059	.367	-.050	-.162	.872
	Par CB X Adol SS X Par Dep	-1.718	.745	-.674	-2.306	.025
	Par CB X Adol SS X Adol Dep	-.228	.386	-.149	-.590	.557
	Par CB X Par Dep X Adol Dep	1.008	.610	.763	1.653	.104
	Par SS X Adol CB X Par Dep	.093	.500	.043	.186	.853
	Par SS X Adol SS X Par Dep	1.265	.692	.695	1.829	.073
	ParSS X Adol SS X Adol Dep	-.029	.297	-.016	-.099	.922
	Par SS X Adol Dep X Par Dep	-.626	.271	-1.269	-2.309	.025
	Adol CB X Adol SS X Par Dep	.927	.447	.415	2.074	.043
	Adol CB X Adol SS X Adol Dep	.024	.190	.030	.128	.899
	Adol CB X Par Dep X Adol Dep	.515	.604	.253	.852	.398
	Adol SS X Par Dep X Adol Dep	-.985	.602	-.562	-1.637	.108
5	(Constant)	16.086	2.584		6.226	.000
	Age	-.272	.129	-.253	-2.109	.041
	Gender	-.519	.436	-.158	-1.192	.240
	Income	-.137	.169	-.110	-.808	.424
	Ethnicity	-.312	.193	-.228	-1.622	.113
	Parent Cost-Benefit	.429	.371	.276	1.159	.254
	Parent Severity Susceptibility	1.229	.390	.756	3.152	.003
	Adolescent Cost-Benefit	.057	.404	.035	.140	.889
	Adol Severity Susceptibility	.210	.366	.128	.575	.569
	Parent Depression	-.230	.353	-.141	-.651	.519
	Adolescent Depression	.706	.389	.423	1.817	.077
	Parent CB X Parent Depression	.330	.608	.290	.543	.590
	Parent CB X Adol Depression	-.258	.475	-.181	-.544	.590
	Parent SS X Parent Depression	1.086	.575	1.114	1.887	.067
	Parent SS X Adol Depression	.887	.575	.605	1.543	.131
	Adolescent CB X Parent Dep	.337	.625	.137	.539	.593
	Adol CB X Adol Depression	.088	.471	.060	.186	.854

Adolescent SS X Parent Dep	1.267	.940	.506	1.348	.186
Adolescent SS X Adol Dep	-.407	.506	-.260	-.805	.426
Parent Dep X Adol Dep	-.128	.520	-.114	-.246	.807
Par CB X Par SS X Par Dep	.102	.442	.132	.230	.819
Par CB X Par SS X Adol Dep	-.762	.555	-.584	-1.372	.178
Par CB X Adol CB X Par Dep	-1.020	.895	-.394	-1.139	.261
Par CB X Adol CB X Adol Dep	.540	.635	.450	.850	.400
Par CB X Adol SS X Par Dep	-1.610	.821	-.632	-1.962	.057
Par CB X Adol SS X Adol Dep	-.373	.800	-.245	-.466	.644
Par CB X Par Dep X Adol Dep	1.764	1.069	1.335	1.651	.107
Par SS X Adol CB X Par Dep	.081	.674	.038	.119	.906
Par SS X Adol SS X Par Dep	.818	.934	.450	.876	.386
ParSS X Adol SS X Adol Dep	-.788	.906	-.430	-.870	.390
Par SS X Adol Dep X Par Dep	.446	.842	.904	.529	.600
Adol CB X Adol SS X Par Dep	-.279	.912	-.125	-.306	.761
Adol CB X Adol SS X Adol Dep	-.125	.471	-.154	-.265	.793
Adol CB X Par Dep X Adol Dep	.271	.908	.133	.299	.767
Adol SS X Par Dep X Adol Dep	-.393	.972	-.224	-.404	.688
Par CB X Par SS X Adol CB X Par Dep	-1.342	.918	-.671	-1.462	.152
Par CB X Par SS X Adol CB X Adol Dep	1.807	.792	1.151	2.280	.028
Par CB X Adol SS X Par SS X Par Dep	-1.469	.796	-.731	-1.845	.073
Par CB X Adol SS X Par SS X Adol Dep	-.101	.825	-.051	-.122	.903
Par CB X Par SS X Par Dep X Adol Dep	1.311	.760	2.227	1.726	.092
Par CB X Adol CB X Adol SS X Par Dep	.191	1.066	.089	.179	.859
Par CB X Adol SS X Adol CB X Adol Dep	.136	.438	.181	.310	.758
Par CB X Adol CB X Par Dep X Adol Dep	-.292	1.280	-.118	-.228	.821
Par CB X Adol SS X Par Dep X Adol Dep	-.657	1.302	-.275	-.504	.617
Par SS X Adol CB X Adol SS X Par Dep	-.696	1.110	-.310	-.627	.534
Par SS X Adol CB X Adol SS X Adol Dep	-.669	.401	-.705	-1.668	.103
Par SS X Adol CB X Par Dep X Adol Dep	.562	.833	.405	.675	.503
Par SS X Adol SS X Par Dep X Adol Dep	-1.192	1.097	-1.220	-1.086	.284
Adol CB X Adol SS X Par Dep X Adol Dep	-.592	.830	-.351	-.714	.480

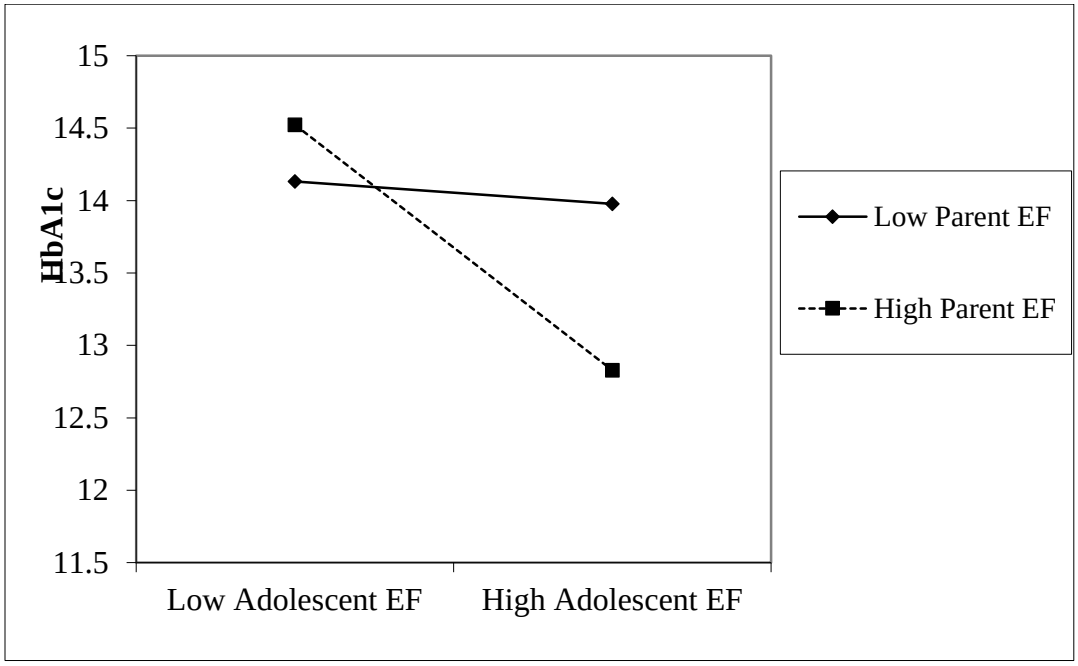
6	(Constant)	16.898	2.900		5.826	.000
	Age	-.274	.139	-.255	-1.974	.057
	Gender	-.724	.463	-.220	-1.563	.127
	Income	-.164	.180	-.132	-.914	.368
	Ethnicity	-.370	.246	-.270	-1.505	.142
	Parent Cost-Benefit	.600	.420	.385	1.430	.162
	Parent Severity Susceptibility	1.517	.484	.933	3.131	.004
	Adolescent Cost-Benefit	.161	.435	.100	.370	.714
	Adol Severity Susceptibility	.136	.506	.083	.269	.790
	Parent Depression	-.416	.443	-.255	-.938	.355
	Adolescent Depression	.839	.448	.503	1.875	.070
	Parent CB X Parent Depression	.613	.724	.539	.847	.403
	Parent CB X Adol Depression	.350	.639	.245	.548	.588
	Parent SS X Parent Depression	1.767	.714	1.813	2.475	.019
	Parent SS X Adol Depression	.753	.641	.514	1.175	.248
	Adolescent CB X Parent Dep	-.042	.768	-.017	-.055	.956
	Adol CB X Adol Depression	.754	.621	.515	1.215	.233
	Adolescent SS X Parent Dep	1.698	1.244	.679	1.365	.182
	Adolescent SS X Adol Dep	-.978	.702	-.625	-1.394	.173
	Parent Dep X Adol Dep	-.248	.696	-.220	-.356	.724
	Par CB X Par SS X Par Dep	.413	.577	.535	.716	.479
	Par CB X Par SS X Adol Dep	-.843	.708	-.647	-1.192	.242
	Par CB X Adol CB X Par Dep	-1.493	1.203	-.576	-1.241	.223
	Par CB X Adol CB X Adol Dep	.502	.749	.418	.671	.507
	Par CB X Adol SS X Par Dep	-1.436	.872	-.564	-1.646	.109
	Par CB X Adol SS X Adol Dep	-.490	.967	-.321	-.507	.616
	Par CB X Par Dep X Adol Dep	2.530	1.325	1.915	1.909	.065
	Par SS X Adol CB X Par Dep	.774	.955	.361	.811	.423
	Par SS X Adol SS X Par Dep	1.010	1.024	.555	.987	.331
	ParSS X Adol SS X Adol Dep	-1.640	1.050	-.895	-1.562	.128
	Par SS X Adol Dep X Par Dep	1.104	1.036	2.240	1.066	.294
	Adol CB X Adol SS X Par Dep	.066	1.201	.029	.055	.957
	Adol CB X Adol SS X Adol Dep	-.498	.584	-.614	-.852	.400
	Adol CB X Par Dep X Adol Dep	.889	1.025	.436	.868	.392
	Adol SS X Par Dep X Adol Dep	-.554	1.123	-.316	-.493	.625
	Par CB X Par SS X Adol CB X Par Dep	-.233	1.674	-.117	-.139	.890
	Par CB X Par SS X Adol CB X Adol Dep	1.801	1.111	1.147	1.621	.114
	Par CB X Adol SS X Par SS X Par Dep	-2.209	1.125	-1.099	-1.963	.058
	Par CB X Adol SS X Par SS X Adol Dep	-.553	1.334	-.281	-.415	.681
	Par CB X Par SS X Par Dep X Adol Dep	1.675	.866	2.845	1.934	.062

Par CB X Adol CB X Adol SS X Par Dep	.617	1.860	.287	.332	.742
Par CB X Adol SS X Adol CB X Adol Dep	-.559	.909	-.744	-.615	.543
Par CB X Adol CB X Par Dep X Adol Dep	-1.030	1.893	-.416	-.544	.590
Par CB X Adol SS X Par Dep X Adol Dep	-.564	1.616	-.236	-.349	.730
Par SS X Adol CB X Adol SS X Par Dep	-1.539	1.532	-.686	-1.005	.322
Par SS X Adol CB X Adol SS X Adol Dep	-1.730	.961	-1.822	-1.800	.081
Par SS X Adol CB X Par Dep X Adol Dep	1.457	1.072	1.049	1.359	.183
Par SS X Adol SS X Par Dep X Adol Dep	-2.184	1.448	-2.235	-1.508	.141
Adol CB X Adol SS X Par Dep X Adol Dep	-.880	1.063	-.522	-.828	.414
Par CB X Par SS X Adol CB X Adol SS X Par Dep	.062	1.812	.032	.034	.973
Par CB X Par SS X Adol CB X Adol SS X Adol Dep	.185	1.057	.224	.175	.862
Par CB X Par SS X Adol CB X Par Dep X Adol Dep	.678	1.687	.475	.402	.691
Par CB X Par SS X Adol SS X Par Dep X Adol Dep	-1.187	3.259	-.855	-.364	.718
Par CB X Adol CB X Adol SS X Par Dep X Adol Dep	-.903	1.860	-.414	-.486	.631
Par SS X Adol CB X Adol SS X Par Dep X Adol Dep	-3.058	2.094	-1.631	-1.460	.154

	F	F Sig.	R	R^2	R^2 Change	F Change	Sig. F Change
Model 1	3.704*	.008	.156	-.033	.025	.511	.746
Model 2	4.273*	.000	.318	-.103	.076	1.016	.425
Model 3	2.449*	.004	.462	-.136	.085	.557	.652
Model 4	2.035*	.010	.496	.249	.063	.258	.996
Model 5	1.920*	.019	.698	.487	.238	1.128	.370
Model 6	1.727	.048	.574	.329	.000	.037	.848

* Indicates significance at $p < .025$

Figure 6.
Parent Executive Functioning as a moderator of the relationship between Adolescent Executive Functioning and HbA1c



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