An Analysis of Adherence in Childhood Diabetes:
Social Learning and Family Systems Variables

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Dissertation submitted to the Faculty of
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree

Doctor of Philosophy
in
Clinical Psychology

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March 30, 1998
Blacksburg, VA
Keywords: diabetes, adherence, metabolic control, pediatrics

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The purpose of the current study was threefold: 1) to assess youths’ and parents’ perceptions of their competency in managing diabetes, 2) to assess family flexibility and cohesiveness, and 3) to assess the utility of self-efficacy and family factors as predictors of adherence and metabolic control. Participants included 62 youths with insulin-dependent diabetes mellitus (IDDM) and their parents. Parents’ and youths’ perceptions of their abilities in diabetes and related situations, family cohesion and adaptability, and perceptions of the family’s ability to integrate the demands of the diabetes regimen into general family routines were assessed. Results suggested that both social learning factors and general family relations were important in the prediction of youths’ adherence to the treatment regimen for diabetes and metabolic control. Moreover, family efficacy and family cohesion were related, suggesting the need for models of assessment and intervention that include both social learning and general family functioning variables.
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Recent years have seen enormous growth and reconceptualization in approaches to understanding the impact of chronic illness on children and their families. Due to increasingly sophisticated medical advances, the prognosis for pediatric populations afflicted with chronic illness has improved dramatically. In turn, the focus has shifted from a deficit-centered approach towards models that take into account coping resources and the individual competence of the child in managing the illness (Eiser, 1990; Potter & Roberts, 1984). In pediatrics, the role of health-related behaviors in the prevention, development, maintenance, and/or exacerbation of disease is increasingly being recognized (Varni & Wallander, 1984), and recent research and practice has emphasized the management of chronic disorders and related behavioral and psychosocial factors. Although both the significance of the interrelationship between health-related behaviors and chronic disease prevention and management, and the instrumental role of the child and his/her family in managing chronic illness have been acknowledged, issues concerned with long-term adherence to therapeutic regimens remain.

Adherence is a central construct in most psychological research aimed at improving health outcomes, and is a major area of concern for child and adolescent health care. The effectiveness of treatment for chronic illness should ultimately be evaluated in relation to the efficacy of treatment and the rate of adherence (Epstein & Cluss, 1982). In general, complexity and duration of treatment regimens have been identified as the most important determinants of nonadherence (Epstein & Cluss, 1982; Varni & Wallander, 1984). Given the complex nature and life-long duration of the treatment regimens for most chronic illnesses, it is not surprising that the estimates of nonadherence for chronic conditions are as great as 50% (DiMatteo & DiNicola, 1982).

Specifically, childhood chronic illnesses often require complex treatment regimens. Medicines may need to be ingested or injected daily, and often dietary or activity demands or restrictions are prescribed. Typically the physician instructs the mother and child on the appropriate treatment behaviors, however it is the family that must carry out the protocol on a daily basis (Johnson, 1995). Not only must an effective treatment protocol be designed, but also the family must follow the treatment regimen as prescribed if the child is
to benefit. However, given the complexity and life-long nature of the treatment regimen for chronic illnesses such as juvenile diabetes, poor adherence rates are frequently documented.

**Overview of Juvenile Diabetes**

Insulin-dependent diabetes mellitus (IDDM), also known as Type I or juvenile-onset diabetes, is the most common endocrine disorder of childhood (La Greca, 1988), affecting approximately 1 in 800 children under the age of 18 (Johnson, 1995). IDDM is a chronic, systemic disease characterized by complete pancreatic failure resulting in dysfunctional metabolism of carbohydrate, fat, and protein, and requiring daily exogenous insulin replacement by injection for survival. It is estimated that of the 2.5% of the total population in the United States has diabetes, and that 5-10% of this group develop the disease during childhood and depend on insulin for their survival (Babani, Banis, Thompson, & Varni, 1987). Although the etiology of IDDM is still unclear, it is hypothesized that genetic factors as well as viral infection cause the destruction of beta-cells in the pancreas which are responsible for the production of insulin in the body.

The medical management of IDDM is complicated and requires lifelong treatment, with the goal of maintaining glucose levels as close to the normal range (80-120mg/dl) as possible. However, current methods of exogenous insulin replacement only crudely approximate normal pancreatic function (Johnson, 1995). Consequently, both hyperglycemia (excessively high blood sugar) and hypoglycemia (excessively low blood sugar) can and do occur. If the patient eats too much or too little, given the available supply of insulin in the body, hyper- or hypoglycemia respectively, will occur. Thus the patient is often told to eat small amounts frequently throughout the day.

Treatment is further complicated by other factors that affect insulin action. Exercise, considered beneficial because it improves insulin action, may also result in hypoglycemia if insufficient calories are consumed. Because of the interacting effects of diet, exercise, illness, emotional state, and insulin availability, blood glucose levels may vary considerably over the course of a day (Johnson, 1995). Subsequently, blood glucose levels must be closely monitored in order to determine the patient’s most appropriate insulin dose and to manage episodes of hyper- and hypoglycemia. Children are usually
advised to test glucose three to four times per day. The results are recorded on a log form along with each insulin dose and when high levels of glucose are present (hyperglycemia), the child must also test for the presence of ketones to determine the extent to which the body is converting fatty tissue to energy. Additionally, the child must learn how to recognize the signs of hyper- and hypoglycemia so that they may be treated properly. However, the symptoms of hypoglycemia have been found to vary considerably from one person to the next, so that the individual must learn to recognize his or her own typical response (La Greca, 1988).

Thus, on a daily basis, IDDM patients require multiple insulin injections, which most children are capable of around 9 years of age (Johnson, 1984) and urine or blood glucose tests, and they must follow a consistent diet low in saturated fat, engage in regular physical exercise, and maintain specific hygiene behaviors. Furthermore, these activities must be conducted in a prescribed temporal relationship to each other such as having insulin injections within an hour before a meal (Glasgow, McCaul, & Schafer, 1986; La Greca, 1988).

**Diabetes and Adherence**

Given the elaborate nature of the treatment regimen for diabetes, it is not surprising that researchers have reported low levels of pediatric patients’ adherence to IDDM regimens. Furthermore, adolescents with IDDM are known to be less adherent than their younger counterparts (Hanson, Henggeler, Harris, Cigrang, Schinkel, et al., 1992; Jacobson, Hauser, Lavori, Wolfsdorf, Herskowitz, et al., 1990), although they typically know more about their diabetes (Weist, Finney, Barnard, Davis, & Ollendick, 1993). It has been suggested that by the time adolescents reach the age of 15, their parents’ level of involvement in implementing the treatment regimen, coupled with an increase in adolescent responsibility and the development of a less rule-oriented approach to diabetes care within the family, may underlie the poorer adherence seen during the adolescent years (Johnson, Kelly, Henretta, Cunningham, Tolner, & Silverstein, 1992).

Failure to comply with the diabetic regimen can result in serious short-term complications such as hypoglycemia, hyperglycemia, ketoacidosis, and coma. Long-term complications include retinopathy, atherosclerosis, and neuropathy (Babani et al., 1987). Overall, 2-3%
of children with IDDM die within the first 10 years after diagnosis and 12-13% die within 20 years, usually from acute complications of excessive hyper- or hypoglycemia (Johnson, 1995).

Behavioral researchers interested in diabetes continue to assess and develop models for predicting and intervening around issues of adherence. Prior studies have demonstrated the relative inefficacy of education in altering patterns of adherence, and have underlined the role of psychosocial factors in promoting or impeding patient adherence (Jacobson, 1986). Although most diabetes programs have not been empirically evaluated, there is little doubt that some programs do improve the knowledge of some patients. However, while knowledge may be a necessary condition for good adherence, it is not a sufficient condition (Johnson, 1984). Other factors, such as parental involvement in the child’s care (Hanson, Henggeler, & Burghen, 1987), parent-child relationships (Miller-Johnson, Emery, Marvin, Clarke, Lovinger, & Martin, 1994), sibling relations (Hanson, Henggeler, Harris, Cigrang, Schinkel, Rodrigue, & Klesges, 1992), and enhancing commitment to the medical regimen (Putnam, Finney, Barkley, & Bonner, 1994) have been shown to play important roles. Moreover, adherence should be reconceptualized as a more dynamic process, in which patients change their behavior in response to changes in diet, exercise, illness episodes, or glucose test results.

Questions about factors related to nonadherence that might be targeted for change in efforts to help patients and their families better follow medical recommendations remain unanswered in part because of definitional weaknesses. Adherence has traditionally been conceptualized as a trait-like characteristic of the patient. Some patients are viewed as adherent and others as nonadherent, suggesting that if a patient is adherent/ nonadherent with one component of the treatment regimen, he or she will be adherent/ nonadherent with the remaining components. The available literature clearly rejects this view (Glasgow et al., 1986; Johnson, Silverstein, Rosenbloom, Carter, & Cunningham, 1986; Johnson et al., 1990). A patient’s behavior with regard to one aspect of the treatment regimen is not predictive of the same patient’s behavior concerning other regimen components (Johnson, 1995; Maddux, 1995). These findings suggest that both the definition, and subsequent measurement, of adherence for chronic illness will require a multicomponent strategy,


although establishing a valid measure of diabetic adherence has been difficult due to the complexity and pervasiveness of the regimen (Brownlee-Duffeck, Peterson, Simonds, Goldstein, Kilo, & Hoette, 1987).

Moreover, in IDDM populations there is increasing evidence that adherence behaviors are not strongly correlated with one another. Johnson and colleagues (1986) subjected 13 diabetes adherence behaviors quantified from a sample of 168 children and adolescents with IDDM to a principal component factor analysis and found that a five-factor solution resulted that accounted for over 70% of the variance. Subsequently, confirmatory factor analysis was applied to a second sample of 162 children and adolescents with IDDM, and the first four factors were confirmed. Specifically, Exercise (comprised of three measures), Injection (4 measures), Diet Type (2 measures), and Eating/Testing Frequency (2 measures) were confirmed, suggesting a multivariate conceptualization in which adherence to distinct components of the treatment regimen would most reliably be estimated when measured separately. Given that different regimen behaviors are unlikely to be related to one another, attempts to measure adherence using single-indicator assessment methods will inadequately capture the complexity of adherence, and therefore assessment methods that focus on multiple components of the complex regimen are more appropriate.

The Relationship Between Adherence and Health Status. The goal of treatment for diabetes is to maintain blood glucose levels as close to normal as possible. Clearly the child and family’s cooperation must be obtained if that goal is to be attained, and if the serious long-term complications of diabetes are to be delayed, diminished, or even prevented. Thus there is a great deal of emphasis on patient and family adherence to the treatment regimen.

Although adherence, and health status as typically measured by assays of glycosylated hemoglobin, are presumably linked, there has been little empirical investigation of that association. Moreover, studies that do exist report either no relationship between adherence behaviors and glycemic control or a weak association (Brownlee-Duffeck et al., 1987; Glasgow et al., 1987; Johnson, Freund, Silverstein, Hansen, & Malone, 1990; Johnson, 1995; Johnson et al., 1992; Schafer, McCaul,
Glasgow, 1986; Weist et al., 1993). Unfortunately, adherence and diabetes control are often used interchangeably, as if they refer to the same construct. However, at a rudimentary level, a patient’s health is determined by the adequacy of the treatment regimen and, in turn, perfect adherence to an inadequate regimen will not render good metabolic control for the individual with IDDM. Furthermore, an adequate treatment regimen may become inadequate as a consequence of biological or environmental changes; thus changes in the regimen must continually be made in response to the nonstatic factors (Johnson, 1995). Thus, further investigation of the utility of metabolic control as an outcome measure is needed, as well as further examination of the relationship between metabolic control and adherence.

Social Learning Theory

Very recently, social learning theory has become one of the main conceptual bases for family-based clinical interventions conducted in pediatric psychology (Hanson, DeGuire, Schinkel, Henggeler, & Burghen, 1992). Social learning theory proposes that the most important determinants of our behavior are cognitive mediators, or the thoughts and beliefs that we hold about our environment and our behavior. In relation to adherence behaviors, social learning models posit that illness-specific psychosocial factors are of primary importance because they are closest in proximity to the desired behavioral and physical outcomes. Self-efficacy theory (Bandura, 1977) emerged out of social learning theory and has proven useful in understanding and predicting health-related behavior, primarily in adult populations (Aalto, Uutela, & Aro, 1997).

Self-Efficacy. Self-efficacy theory states that a person’s perceived ability (efficacy expectations) on a given task will mediate future attempts to perform that task, and thus significant and lasting behavior change, whether naturally occurring or therapeutically induced, would be preceded by or covary with changes in levels of self-efficacy. According to Bandura’s paradigm, behavior change and maintenance are a function of efficacy expectations as well as expectations about the outcomes that will result from one’s engaging in a behavior (outcome expectations). Outcome and efficacy expectations are differentiated because individuals can believe that a particular course of action will produce certain outcomes, but if they have serious doubts about whether they can perform
the necessary activities such information does not influence their behavior (Bandura, 1977). Thus Bandura has posited that outcome expectations help determine behavior but that they usually depend to a great extent on self-efficacy and that their effects are generally less influential.

Bandura further asserts that in activities where outcomes are highly contingent on quality of performance, efficacy beliefs account for most of the variance in expected outcomes (Bandura, 1986). Considered in the context of the treatment regimen for diabetes, and the necessity of quality performance of the regimen behaviors, the critical role of efficacy expectations becomes apparent. Kingery and Glasgow (1989) examined self-efficacy and outcome expectations in adherence to three areas of the diabetic regimen (diet, exercise, and glucose testing) for adults over 40 with Non Insulin Dependent Diabetes Mellitus (NIDDM), and found that outcome expectations added little to self-efficacy in predicting self-care. Specifically, outcome expectancies did not add to the prediction of dietary adherence and glucose testing, and accounted for only an additional 2% of the variance in exercise adherence when added to self-efficacy. Thus, although there is controversy over the relationship between self-efficacy and outcome expectancy, it appears that measures of outcome expectancies do not add much to the prediction of behaviors or intentions beyond the contributions of self-efficacy beliefs (Maddux, 1995).

Bandura argues that perceived self-efficacy influences all aspects of behavior, including the acquisition of new behaviors (e.g., learning the treatment regimen for a chronic illness), and the inhibition of existing behaviors (e.g., decreasing or stopping cigarette smoking). Self-efficacy also affects people’s choices of behavioral settings, and through expectations of eventual success, it can affect coping efforts. Efficacy expectations determine the amount of effort individuals will expend on a task, and the length of time they will persist in the face of obstacles and aversive experiences. The stronger the perceived self-efficacy, the more active the efforts; those who persist will gain corrective experiences that reinforce their sense of efficacy. In addition, self-efficacy affects people’s emotional reactions, such as anxiety and distress, and thought patterns (Strecher, DeVellis, Becker, & Rosenstock, 1986), and those who relinquish their coping efforts will continue to hold self-debilitating expectations (Bandura, 1977).
Given appropriate skills and adequate incentives, however, efficacy expectations are a major determinant of behavior. Bandura’s theory emphasizes the reciprocal causal relations between environmental, behavioral, and personal factors. Thus self-efficacy judgments are personal factors that mediate the interaction between behavior and environmental factors. Notably, both efficacy and outcome expectations reflect a person’s beliefs about capabilities and behavior-outcome links related to specific behaviors in particular situations. Bandura (1982) is critical of general trait assumptions, and the perspective of the composite view of the individual that is formed through direct experience and the reflected evaluations of others. He contends that the global nature of self-concept detracts from its power to explain behavior in specific situations and does not adequately account for the complexity and variation of efficacy judgment across different activities and situations. Self-efficacy is not a global self-evaluation nor a fixed entity, but rather it refers to particular task characteristics and demands. It is dynamic and malleable, subject to changes in task demands, situational determinants, social context, and individual development (Berry & West, 1993).

**Self-Efficacy and Adherence: Diabetes and Other Chronic Illnesses**

Recent investigations have been successful in demonstrating the role of cognitive beliefs and attributions in the management of, adjustment to, and course of diabetes. In a four year longitudinal study, Jacobson and colleagues (1990) demonstrated that patient coping abilities and adjustment were predictive of adherence to the diabetic regimen for children and adolescents ages nine to sixteen. Furthermore, Kuttner, Delamater, and Santiago (1990) found that the learned helplessness attributional style was significantly associated with poorer metabolic control in youth ages 10 to 16 with diabetes. These findings suggest the need to enhance understanding with regard to other cognitive factors, such as self-efficacy, that may also impact adherence behaviors in children and adolescents with diabetes.

**Children’s Self-efficacy.** Literature on the relationship of self-efficacy to adherence in pediatric conditions is scarce however, especially given the increased recognition self-efficacy has received as a predictor of health behavior change and maintenance in adults (Godin, 1993; Strecher et al., 1986). To date, only a few researchers
have included self-efficacy in studies of pediatric populations with chronic illness, providing preliminary correlational evidence of the relationship of self-efficacy to facets of various treatment regimens. Given that children and adolescents with a chronic illness such as diabetes face increasing responsibilities for managing their own treatment (La Greca, 1988; La Greca & Schuman, 1995), that perceived efficacy is dynamic and malleable (Berry & West, 1993), and that it has been related to a number of changes in adult health behaviors (Holden, 1991), the implications for self efficacy in predicting and improving adherence behaviors in pediatric populations is clear.

Grossman and colleagues (1987) created a scale for adolescents with IDDM, and results indicated that diabetes self-efficacy was significantly associated with metabolic control, a health status variable associated with adherence, and associated with self-esteem. Sample items that ask the adolescent to indicate how much he/she believes he/she can/not do what is asked include the following: “Figure out what foods to eat when I am away from home” and “Tell a friend I have diabetes.” Furthermore, Havermans and Eiser (1991) modified the scale for a British sample of children, and derived three factors: personal responsibility (e.g., first item stated above), social communication (e.g., second item stated above), and minimization of threat (e.g., “avoid getting dents from injections”). In comparison to healthy children, children with IDDM, although they recognized the potential importance of their own behavior for health, were less confident in their abilities to implement necessary self-care tasks (low responsibility-efficacy). Additional research is warranted that examines the relationship of self-efficacy to the multiple facets of adherence. In turn, the above finding may be of particular relevance in planning treatment interventions, suggesting that additional emphasis may need to be on bolstering children’s confidence to perform self-care tasks.

An investigation of children with asthma also found a significant relationship between self-efficacy and self management behavior (Clark, Rosenstock, Hassan, Evans, Wasilewski, Feldman, & Mellins, 1988), although the authors conclude that the one item used to measure self-efficacy may more nearly measure locus of control. Moreover, two studies (Mesters, Meertens, Crebolder, & Parcel, 1993; Mesters, Meertens, Kok, & Parcel, 1994) have provided evidence that self-efficacy can be increased for parents of
children with asthma who participate in a community based program. However, no studies to date have attempted to evaluate the sources of efficacy for children with chronic illness, or increase perceived efficacy for adherence to the treatment regimen.

It should also be noted that a few studies in the adult literature provide correlational evidence that self-efficacy consistently improves the prediction of self-care behaviors related to the regimen for diabetes (Glasgow, Toobert, Riddle, Donnelly, Mitchell, & Clader, 1989; McCaul, Glasgow, & Shafer, 1987). Results of a recent investigation assessing efficacy expectations for adherence to multiple components of the treatment regimen showed that self-efficacy was a significant predictor of later adherence to diabetes treatment even after past levels of adherence were taken into account (McCaul & Glasgow, 1989). Past levels of adherence in turn were significantly associated with posttest levels of blood concentration of glucose. In summary, success of investigations utilizing self-efficacy to predict adherence in adult patients with diabetes, although correlational in nature, substantiate the claim that self-efficacy should be further examined for inclusion in models to predict adherence behaviors in children and adolescents with IDDM.

**Parental Self-efficacy.** Bandura’s original definition of self-efficacy expectancy, the conviction that one can successfully execute the behavior to produce the outcomes, is clearly related to acquisition of essential task-related skills necessary for adhering to the diabetes regimen. Immediately after diagnosis with diabetes, it seems valuable, if not essential, to measure parents’, as well as the child’s, abilities to perform elemental acts of the treatment regimen. For example, does the nine year old child with diabetes perceive that he/she is able to use a lancet device to obtain a blood sample from him/herself, as the American Diabetes Association (1983) suggests is an appropriate developmental expectation. Or for instance, are the child and his/her parents able to remember the child’s insulin schedule, and types and doses of insulin to be used? Deficits in patient knowledge and skills further complicate assessing adherence and, more importantly, may result in children with IDDM and their families behaving in nonadherent ways (Johnson, 1995). In fact, studies of children with IDDM injecting insulin or testing glucose have reported
significant procedural errors in a substantial number of the children observed (e.g.,
Johnson, Pollak, Silverstein, Rosenbloom, Spillar, McCallum, and Harkavy, 1982).

Recently, Bandura (1995) has conceptualized self-efficacy as the belief about
whether one can produce the performances required to gain the outcomes. Clearly
perceived efficacy for managing diabetes goes beyond giving oneself an insulin injection or
counting calories. As Bandura (1995) suggests, the self-regulation of health habits
“involves enlistment of complex skills of monitoring one’s behavior and its determinants,
regulating one’s motivation by effective use of self incentives, making decisions that do
not eventuate in risky predicaments, enlisting cognitive aids to bolster self-regulating
efforts, and selecting and structuring environments conducive to healthful practices” (p.
357). Although Bandura’s comments on self-regulation were provided in the context of
safe sexual practices, one can readily see the relevance for adherence to the diabetes
regimen. Moreover, given that children are typically embedded in the family, the regimen
for diabetes mandates that the child and his/her parents manage the above elements in
concert in order to effectively deal with ever changing situations that surround adherence.

Collective Efficacy of the Family. Given the reconceptualization of adherence to
the diabetes regimen provided by Johnson and colleagues (1986; 1990) and the complexity
of the tasks necessary for adherence, self-efficacy not only of individuals (e.g., child and
parents) but of the family as a collective group warrants attention in pediatrics research.
As children and their families assume the majority of the responsibility for the tasks
associated with managing diabetes, family perceptions of their ability to integrate and meet
the demands of the diabetes regimen may be paramount in understanding adherence as
well as metabolic control. Thus, efficacy for the regimen tasks is necessary as the family
attempts to regain and/or maintain its balance of rules, routines, and communication.

Furthermore, efficacy beliefs must be measured against gradations of challenges or
obstacles to successful performance (Bandura, 1995). In the context of diabetes, over
time the importance of managing the illness without disrupting family routines is
paramount. Ultimately, it may be necessary to establish the child’s and family’s
perceived abilities to maintain regimen behaviors (e.g., insulin injections, diet behaviors)
during vacations and holidays, when the child is away from home (e.g., at summer camp
or with peers), and/or when the child (or other family member) experiences illness episodes unrelated to diabetes.

Recently, Zaccaro and colleagues (1995) have suggested that multiple levels of interdependence influence self-efficacy. In turn, beyond the resources and support required from the environment, the actions of, for example, children with diabetes are most likely highly dependent on integration, coordination and cooperation of the family (Anderson, Auslander, Jung, Miller, & Santiago, 1990). As such, the child’s actions may be so dependent upon the actions of other family members to produce a collective outcome. In other words, intervention on an individual level may be necessary, however managing diabetes may also be partially explained by perceptions of the family’s collective competence. Thus, the family’s sense of efficacy is dependent not only on beliefs about how well each family member can perform to accomplish tasks necessary for adherence, but also how well the family members can coordinate and combine their resources to achieve adherence in concert with daily routines.

Bandura (1986) suggested that people do in fact have a sense of collective efficacy that they can solve their problems and improve their lives through concerted effort. Thus, individuals may believe their environment (e.g., the family) to be efficacious (or incompetent) with respect to specific situational demands such as managing diabetes. Such beliefs will subsequently influence an individual’s choices, motivation, actions, and performance within the collective (Bandura, 1986). Furthermore, the collection of the individual reactions will dictate the nature of the collective response (Zaccaro et al., 1995). Thus, in the context of diabetes, the role of collective efficacy of the family as it predicts and potentially enhances adherence to the treatment regimen for diabetes, as well as metabolic control, should be examined.

Family Efficacy and Cohesion. The importance of self-efficacy beliefs for behavior is that such beliefs promote greater motivation, perseverance, and persistence (Bandura, 1977; 1986). Research has revealed that individuals who are highly efficacious tend to persist despite repeated failure (Schunk & Hanson, 1985). Moreover, cohesion has also been positively linked to performance success (Spink, 1990). Although both cohesion and self-efficacy have been positively linked to performance success, the relationship between
the two concepts is less clear. Zaccaro et al. (1995) suggested that group cohesion may be a consequence of collective efficacy, based on findings that perceptions of collective efficacy fully mediated the relationship between the effects of prior performance and subsequent group cohesion. However, other research demonstrated that cohesiveness differentiated between low and high collective efficacy groups, suggesting that group cohesion may be an antecedent of collective efficacy (Spink, 1990).

While individual-level cohesion, conceptualized as an individual’s desire for membership in a group, may be a predictor of collective efficacy, group-level cohesion may be a consequence of collective efficacy. In other words, a family’s cohesiveness as one strategy to avoid disruption of the family, in light of the need to integrate the treatment regimen for diabetes, may be the result of the family’s sense of their ability to adhere to the demands of the regimen. The current study will examine the relationship whereby family efficacy may mediate the relationship between self-efficacy and cohesion of the family.

Family Context and Adherence

For the family, and particularly the parents, helping children manage a chronic illness such as diabetes may entail encouraging the child to be strong and persistent in the face of painful or inconvenient treatments, as well as helping the child with tasks such as injections or other self-administered therapies. Undoubtedly, parents experience uncertainty between the need to promote self-efficacy in the child and to protect him or her from harm and unnecessary medical complications. Clearly there are tradeoffs between the parents’ handling situations in ways that ensure the child’s health, and their provision of opportunities for the child to develop his or her own competencies, even in the face of possible failure and medical risk (Anderson & Coyne, 1993). As a child with diabetes attempts to adapt to the illness and treatment (e.g., how to accommodate to inconvenient treatments and how to fit dietary requirements into as normal a life as possible), the family’s ability to adapt to the lifestyle changes required may also be of critical importance for adherence to the treatment regimen.

While it is assumed from a social learning perspective that specific proximal child and parent behaviors are linked most strongly with adherence behaviors, family systems
models (e.g., Hanson et al., 1992; Kazak, 1989) have posited the role of distal and proximal family factors. More specifically, adherence to the treatment regimen by children with IDDM and their parents is influenced by the interplay of distal factors such as parental marital satisfaction and proximal factors such as parent-child conflict (Hanson et al., 1990). Moreover, children and adolescents live within the context of their families, which have rules, organizing principles, and belief systems about health, development, and illness (Kazak, Segal-Andrews, and Johnson, 1995). Therefore, the meaning of, and response to a child’s medical condition are greatly affected by the family system in which the child or adolescent lives. As such, in the case of childhood chronic illness, families generally assume primary responsibility for tasks associated with management of the illness (Sargent & Liebman, 1985). Specifically, IDDM places numerous demands on the family, evidenced by the complex nature of the treatment regimen, as the child or adolescent and his/her parents negotiate responsibilities in efforts to manage the illness. Thus, systems models assume that general family relationship variables, such as cohesion and adaptability/flexibility, contribute to children’s health outcomes above and beyond the contributions of illness-specific proximal factors (Hanson et al., 1990). Moreover, continual adjustments may need to be made in family roles and responsibilities to adapt to the demands of the treatment regimen on the family (Anderson et al., 1990).

As a system, the family seeks to maintain homeostasis or a steady state (Bertalanffy, 1968), and the diagnosis of the child’s chronic illness may logically serve as a perturbation to the system, threatening its balance. For healthy functioning, adaptability, cohesiveness, and communication are necessary to meet the changing needs of the individuals and the family (Kazak et al., 1995; Olson, Sprenkle, & Russell, 1979). Hanson and colleagues (1989) found that good metabolic control was associated with high family cohesion, family flexibility, and high marital satisfaction in intact families of adolescents with IDDM. In the context of adherence to the regimen for diabetes, the family may strive to re-establish its homeostatic balance, placing greater emphasis on particular regimen behaviors at a given time in efforts to attain that goal. Thus the goals of the family and the emphasis the family places on regimen behaviors may warrant emphasis by practitioners.
and health care providers as attempts are made to integrate the regimen into the family system.

**Summary**

In summary, the medical management of diabetes is complicated and requires lifelong treatment. Given the complexity and duration of the regimen, the reportedly low levels of pediatric patients’ adherence is not surprising. Researchers continue to develop means by which to predict adherence and plan interventions around those issues. The complexity of the treatment regimen for diabetes benefits from a reconceptualization of adherence based on the multitude of factors involved in managing the illness for the child and his/her family. Moreover, insulin dependent diabetes is typically diagnosed at a young age when children and adolescents are living within the context of their families. Thus it is useful to examine the regimen behaviors in the context of the family, and to assess adherence and metabolic control in that context, as efforts are made to re-establish the balance of rules, routines, flexibility, and cohesiveness. Given circumstances where health practices are believed to lead to desired consequences but change is difficult, such as adherence to the diabetes regimen, self-efficacy may be paramount. It has been suggested that both self-efficacy for the tasks related to the regimen and efficacy for self-regulation be considered. Last, it is suggested that the collective efficacy of the family be considered as it relates to adherence to the treatment regimen for diabetes and metabolic control.

Empirical findings in children and adolescents with IDDM have demonstrated significant associations between illness-specific family functioning and health outcomes (Hanson et al., 1987) as well as between general measures of family functioning and health outcomes (Hanson, Henggeler, Harris, Burghen, & Moore, 1989; McCaul et al., 1987). The current study, was aimed at examining the utility of individual and family efficacy, and general family functioning variables for predicting adherence and metabolic control of children with IDDM. Moreover, the associations between social learning variables and general family variables were examined in an effort to determine the unique contributions of each as well as their collective utility in predicting adherence and metabolic control.
Hypothoses

**Hypothesis 1:** Self-efficacy, family efficacy, and family cohesion and adaptability will predict children and adolescents’ adherence to the treatment regimen for diabetes.

Given the complex nature of the treatment regimen for diabetes, the first hypothesis was aimed at determining the predictive utility of youths’ self-efficacy for diabetes, the family’s collective ability to combine and coordinate their resources to manage daily routines in the context of managing diabetes, and general family cohesion and adaptability for adherence. Adherence, based on the semi-structured interview utilized in the current study, is conceptualized as youths’ management of the multiple components of the treatment regimen for IDDM.

**Hypothesis 2:** Self-efficacy, family efficacy, and family cohesion and adaptability will predict children and adolescents’ metabolic control.

Metabolic control, as measured by hemoglobin assays, provides an estimate of the mean concentration of blood glucose in the blood for approximately three months preceding the test. Given the global nature of the measure, and the necessity of examining multiple psychosocial factors related to metabolic control, the second hypothesis examined the predictive utility of parental self-efficacy for managing diabetes in addition to youths’ self-efficacy. Consistent with the first hypothesis, family efficacy and general family cohesion and adaptability were also utilized as predictors of metabolic control.

**Hypothesis 3:** Family efficacy and family cohesion are interrelated.

Based on previous empirical findings, as well as the proposed utility of illness-specific and general family variables for predicting outcome for youths with IDDM, it is suggested that family efficacy and family cohesion will be interrelated. Specifically, it is suggested that families in which there is a sense of collective competence will have closer emotional bonds.

**Hypothesis 4:** Family efficacy will mediate the relationship between self-efficacy and family cohesion.

In other words, self-efficacy leads to family efficacy which leads to higher levels of family cohesion. The current study posits that individual self-efficacy for managing diabetes contributes to perceptions of the family’s collective competence for integrating
the demands of the treatment regimen into family routines. In turn, the family’s collective
efficacy leads to a greater sense of cohesion and desirability of the family.

**Hypothesis 5:** Family efficacy will partially mediate the relationship between self-
efficacy and adherence.

It is suggested that youths’ self-efficacy leads to family efficacy which leads to
adherence to the multiple components of the treatment regimen for diabetes. Moreover,
although youths’ self-efficacy likely has a direct impact on adherence, it is also proposed
that it contributes to the family’s sense of competence which, in turn, influences overall
adherence.

**Method**

**Participants**

Participants were 62 children and adolescents, or youths (32 female, 30 male),
with IDDM and their parents recruited through a world wide web site, a summer camp
sponsored by the American Diabetes Association (ADA), and a diabetes clinic affiliated
with a Midwestern urban children’s hospital. The youths’ mean age was 12.4 years ($SD$
$=1.8$; range = 11.0 - 15.8) and the mean duration of IDDM was 3.6 years ($SD = 2.6$, range
$= 1 - 11$ years). Eighty-seven percent of the youths were white, 5% were African
American, and 8% of participants did not report their ethnicity. Participants recruited
through the web site included families from countries such as New Zealand, South Africa,
Australia and Canada. Eighty-one percent of the youths were from two-parent families.
The mean socioeconomic status (SES) of the families in the total sample was 47.9
(Hollingshead, 1975), indicative of minor professionals, technical workers, and medium
business owners, and the range was 27 (semiskilled workers) to 66 (professionals; major
business owners).

**Procedure**

An advertisement about the current project was posted on the web site for children
with diabetes and their parents, and interested participants completed an electronic form
that was received by the investigator. Interested participants were then mailed packets
including an instruction sheet, questionnaires, consent forms for both parents and youths,
a release of information for the youth’s treating physician, and a postage-paid envelope in
which to return the completed materials. Thirty-five percent of the families who responded to the web site advertisement completed the project, and comprised 68% of the total sample in the study. Another 8% of the participants were recruited at a summer camp in the Midwest for children with diabetes.

Additionally, parents and children scheduled for a clinic appointment at a Midwestern children’s hospital were also asked to participate in the current study. Consent forms were explained and signed at the time of recruitment, and packets were sent home to be completed and returned in the provided envelope. Forty-seven percent of the families recruited through the diabetes clinic at the children’s hospital completed the project, and made up 24% of the total sample in the study. Independent samples t-tests indicated a significant difference (p < .05) on SES between families recruited through the web site and those recruited through the diabetes clinic. Specifically, families recruited through the web site had a slightly higher mean SES (49.9) as compared to the mean SES (43.3) of those families recruited through the clinic. Noteworthy, however, is that the means for both groups fell within the range of minor professionals, technical workers, and medium business owners. No other significant differences were present between the samples with regard to demographic, predictor or outcome variables.

Following receipt of the completed materials, parents were called at times they had designated to complete the semi-structured adherence interview by phone. It was requested that the parent who completed the questionnaires also complete the adherence interview. Eighty percent of the adherence interviews were completed by mothers, 4% were completed by fathers, 14% were completed by mothers and youths together, and 2% were completed by fathers and youths together.

Measures of Predictor Variables

Family Systems Variables

The Family Adaptability and Cohesion Evaluation Scales III (FACES III; Olson, Portner, & Lavee, 1985). The FACES III is an instrument rooted in family systems theory and designed to assess the two major dimensions of the Circumplex Model (Olson, Russell, & Sprenkle, 1983) which include Family Cohesion and Family Adaptability. Family Cohesion is defined in terms of emotional bonding between family members and
assesses the degree to which family members are separated or connected. Ten items were developed to assess the level of Family Cohesion and include the concepts of emotional bonding, supportiveness, family boundaries, time and friends, and interest in recreation. Family Adaptability is defined in terms of the ability of the family system to alter the power structure, role relationships, and rules in response to situational and developmental stress. Ten items were developed to assess the level of Family Adaptability and include the concepts of leadership, control, discipline, roles, and rules.

Adequate psychometric properties have been found using FACES III, and the validity of the measure to assess general family relations has been supported by numerous investigators (e.g., Henggeler, Burr-Harris, Borduin, & McCallum, 1991). Moreover, two factor analytic studies resulted in identical factor structures and the correlation between Cohesion and Adaptability has been reduced to near zero ($r = .03$) suggesting that the two dimensions are independent. Coefficient alpha values yielded means of .75 for the Cohesion Scale, .61 for the Adaptability Scale, and .67 for the Total Scale. The FACES III was administered to the child and the parent, and scores on the Cohesion Scale and the Adaptability Scale were included in the analyses.

Self-Efficacy Variables

Self-Efficacy for Diabetes Scale (SED; Grossman, Brink, & Hauser, 1987). The SED is a 35-item scale and was constructed to assess children and adolescents’ perceptions of their personal ability in diabetes and related situations. Based on Bandura’s conception of self-efficacy, the scale assesses both the magnitude and generality of those beliefs. Three subscales were developed and include: self-efficacy for diabetes specific situations (SED-D; 24 items), self-efficacy for medical situations (SED-M; 5 items), and self-efficacy for general situations (SED-G; 6 items). To evaluate the intensity of self-efficacy, subjects are asked to rate their degree of confidence for all items on a scale of 1 (very sure I can’t) to 6 (very sure I can do what is stated in each item). Thus higher scores on each of the subscales and on the total scale score are indicative of stronger perceptions of self-efficacy. Reliability for the SED total and each of the subscales was calculated with the Kuder-Richardson coefficient. Alphas of .90 and .92 were obtained for the SED total and SED-D, respectively, and the alphas for the SED-M and SED-G
were less impressive although acceptable at .70 and .60 respectively. Adequate construct validity for the measure was also demonstrated by the predicted positive correlations between SED total and the self-efficacy subscales, and measures of locus of control and self-esteem. Specifically, correlations between self-efficacy, and locus of control and self-esteem ranged from .31 to .46 \( (p < .01) \). Moreover, no significant differences were found between girls’ and boys’ beliefs about their diabetes self-efficacy. The current study used the SED-D as an indicator of the child’s self-efficacy related to diabetes.

**Self-Efficacy Measures for Parent and Family.** The current study used a modified version of the SED (Grossman et al., 1987) to measure the parent’s sense of efficacy in relation to managing tasks associated with the child’s adherence to the regimen for diabetes. An acceptable alpha of .83 was obtained for the revised SED total for parents. Moreover, the Family Routines Questionnaire (FRQ; Jensen, James, & Boyce, 1983) was adapted for use in relation to family efficacy. More specifically, the items were framed in terms of how able the family is to do certain things regularly from day to day in the context of having a child with diabetes. The FRQ provided a number of relevant family activities which, given the paucity of existing measures, were easily adapted to incorporate the self-efficacy framework of Bandura (1977). An alpha of .60 was obtained for the modified version of the FRQ used in the current study, and is considered satisfactory.

**Outcome Variables**

**Semi-structured Interview of Adherence.** The Self-Care Adherence Inventory (SCAI; Hanson, 1989; Hanson et al., 1989, 1992) assessed youths’ general dietary behaviors, glucose testing and insulin adjustment behaviors, hypoglycemia preparedness, and overall adherence. High scores reflect good adherence or positive self-care behaviors, and the SCAI has been demonstrated to have favorable psychometric properties. The behaviors assessed by the interview have been demonstrated to be relatively stable across time, as reflected by the 3-month and 6-month test-retest reliabilities of the instrument which were \( r(17) = .70, p \leq .001 \) and \( r(39) = .73, p \leq .001 \), respectively (Hanson et al., 1992, 1996). In addition, the interrater reliability of the adherence interview ranged from \( r(19) = .95, p \leq .001 \) to \( r(39) = .98, p \leq .001 \). Moreover, the overall SCAI score, as well
as factor scores from the interview, have been demonstrated to be significantly related to youths’ metabolic or glycemic control (Hanson et al., 1996).

**Glycosylated Hemoglobin Assays (HA\(_{1c}\)).** HA\(_{1c}\) as a measure of metabolic control was obtained for each subject, as they are part of the routine care for individuals with diabetes. This measure reflects the amount of oxygen-carrying red blood protein that has glucose tightly bound to it and provides a measure of average blood concentration of glucose during the previous 3 months. Moreover, the overall adherence score from the semi-structured interview was found to relate significantly to subjects’ metabolic control (Hanson et al., 1992), despite inconsistencies in previous literature regarding the relationship between adherence and metabolic control. The current investigation further examined the relationship between adherence and metabolic control as measures by glycosylated hemoglobin assays.

**Results**

**Data Analysis**

The data were analyzed with SPSS version 6.0 (SPSS Inc., 1993) for Windows. The central aims of the analyses were to evaluate (a) whether self-efficacy, family-efficacy, and family cohesion and adaptability contribute to youths’ adherence to the treatment regimen for diabetes and metabolic control, (b) whether family efficacy and family cohesion covary, and (c) whether family efficacy mediates the relationship between self-efficacy and family cohesion, and mediates the relationship between self-efficacy and adherence. All tables for the current study are provided in Appendix A. Table 1 provides the means, standard deviations (SDs), and minimum and maximum values for all predictor and outcome variables in the study. In addition, Table 2 provides the descriptive statistics for the subject population in the study.

Hierarchical multiple regression analyses (HMRAs) were conducted for evaluation of the first aim of the study, zero-order correlational analyses assessed the interrelationship between family efficacy and family cohesion, and regression was also utilized to establish the mediating effects of the third aim of the study. The demographic correlates (youths’ age, disease duration, SES) of the variables of interest are presented in Table 3.
Hierarchical Multiple Regression Analyses

Adherence. Hierarchical Multiple Regression Analysis (HMRA) was employed to determine if youths’ self-efficacy, family-efficacy, and family cohesion and adaptability independently accounted for a significant proportion of the variance in youths’ adherence to the treatment regimen for diabetes (Hypothesis 1). Independent variables (IV’s) were entered based on theoretical importance in the prediction of adherence and the results of the HMRA are presented in Table 4.

The table displays the unstandardized regression coefficients (B), the standardized regression coefficients ($\beta$), the incremental variance or semipartial correlations squared ($sr^2$), and $p$-values for each independent variable at its point of entry in the final hierarchical regression equation. Total adjusted $R^2$, which more closely reflects the goodness of fit of the model in the population, is also reported in Table 4 after entry of all independent variables. It should be noted that, given that missing data are random in the current study and in order to retain as many cases in the analyses as possible, correlation coefficients were calculated based on all cases with complete information for the variables being examined. Thus, pairwise missing-value treatment was applied for all regression analyses and slight inconsistencies in correlations are attributable to pairwise selection.

Hypothesis 1 was not supported as there was no evidence that the four IV’s uniquely accounted for a significant amount of the variance in total adherence. Results indicated that youth’s self-efficacy for diabetes significantly accounted for one percent of the variance in total adherence ($R^2 = .03; \text{Adj } R^2 = .01, p < .05$). While the contribution of youth’s self-efficacy to the prediction of adherence is of statistical significance, it is not of practical significance. In addition, the results indicated that family efficacy significantly accounted for seven percent of the variance in total adherence ($R^2 = .12; \text{Adj } R^2 = .07, p < .05$). After all IV’s were entered into the equation, $R^2 = .15$, and adjusted $R^2 = .08$, $p<.05$. Neither youth’s self-efficacy for diabetes nor family efficacy accounted for a greater proportion of the variance when any of the three subscales of the adherence measure (glucose testing adherence, dietary behaviors adherence, and hypoglycemia preparedness) were utilized as the dependent variable (DV).
Prior research has demonstrated that adherence, as measured by the instrument utilized in the current study, strongly related to metabolic control (Hanson, DeGuire, Schinkel, Kolterman, Goodman, & Buckingham, 1996). Thus it is noteworthy that overall adherence, dietary behaviors adherence, and hypoglycemia preparedness were each significantly correlated with metabolic control. Table 5 (Appendix A) provides a pairwise correlation matrix of all variables relevant to the hypotheses in the current study. Specifically, overall adherence was correlated at -.36, dietary behaviors adherence was correlated at -.33, and hypoglycemia preparedness was correlated at -.37 with metabolic control (all at $p < .05$) in the direction which suggests that greater adherence is significantly associated with lower hemoglobin assays and thus better metabolic control.

**Metabolic Control.** HMRA was also utilized to determine the importance of youths’ and parents’ self-efficacy, family-efficacy, and family cohesion and adaptability in predicting metabolic control (Hypothesis 2). Table 6 below summarizes the results of the hierarchical regression.

The table again displays the unstandardized regression coefficients (B), the standardized regression coefficients ($\beta$), the incremental variance or semipartial correlations squared ($sr^2$), and $p$-values for each independent variable at its point of entry in the final hierarchical regression equation. Total adjusted $R^2$, which more closely reflects the goodness of fit of the model in the population, is also reported in Table 5 after entry of all independent variables. Pairwise missing-value treatment was also applied to the analysis for Hypothesis 2.

Results indicated that youth’s self-efficacy for diabetes accounted for twelve percent of the variance in metabolic control ($R^2 = .14$; Adj $R^2 = .12$, $p < .01$), and parent’s self-efficacy for diabetes accounted for an additional five percent of the variance in metabolic control ($R^2 = .20$; Adj $R^2 = .17$, $p < .01$). Thus, addition of parental self-efficacy to the equation resulted in a significant increment in adjusted $R^2$. Neither the addition of family-efficacy nor the addition of family cohesion reliably improved $R^2$. Finally, family adaptability accounted for an additional five percent of the variance in metabolic control ($R^2 = .30$; Adj $R^2 = .22$, $p < .01$). Thus, 22% of the variance was accounted for, and hypothesis 2 was partially supported, with the exceptions of family
efficacy and family cohesion which did not contribute to the variance accounted for in the prediction of metabolic control.

Zero-order Correlation Analyses

Zero-order correlation analyses were utilized to examine the interrelationship between family efficacy and family cohesion (Hypothesis 3). As referenced in Table 5, family cohesion correlated with family efficacy (.38; p< .01). Thus, Hypothesis 3 was supported. There were no significant discrepancies between parents’ and youths’ ratings of family cohesion, based on calculation of discrepancy scores (FACES III; Olson et al., 1985). In addition, parent and youth ratings of family cohesion were significantly correlated (.54, p < .01), and parent and youth ratings of family adaptability were significantly correlated (.40, p < .01). Thus, a composite score of parents’ and youths’ perceptions of cohesion as well as adaptability were utilized in the analyses.

Regression to Test Mediation

Regression was used to establish the mediating effects of family efficacy on the relationship between self-efficacy and family cohesion (Hypothesis 4). In other words, self-efficacy leads to family efficacy which leads to higher levels of family cohesion. This analysis followed the procedure recommended by Baron and Kenny (1986). The first regression equation examined the whether self-efficacy predicted family cohesion. A second equation looked at whether family efficacy predicted family cohesion. Finally, an equation was set up where self-efficacy predicted family efficacy. Refer to Table 7 for those relationships. When all three equations are significant, a fourth equation is examined with the mediator (family efficacy) and the independent variable (self-efficacy) entered sequentially to predict the dependent variable (family cohesion). If the effect of the independent variable (self-efficacy) is nonsignificant then support is provided for a fully mediated relationship (Baron & Kenny, 1986). For partial mediation, the effect of the independent variable (self-efficacy) on the dependent variable (family cohesion) must be less in equation four than in equation one. As seen in Table 7, the first intercorrelation was not significant for the prediction of family cohesion. That held true when self-efficacy was examined as parents’ perceptions or youths’ perceptions. Equation two was significant for the prediction of cohesion and, as discussed in the results of Hypothesis 3,
suggests an interrelationship between family efficacy and family cohesion. Equation three was also significant for the prediction of family efficacy, suggesting an interrelationship between youths’ self-efficacy for managing diabetes and family efficacy. Given that the first equation was nonsignificant, however, the final equation in the mediational analysis could not be examined.

Regression was also utilized to establish the mediating effects of family efficacy on the relationship between self-efficacy and adherence (Hypothesis 5). In other words, self-efficacy leads to family efficacy which leads to higher levels of adherence to the treatment regimen for diabetes. The first regression equation examined whether self-efficacy (youths’ perceptions) predicted overall adherence to the regimen for diabetes. A second equation looked at whether family efficacy predicted overall adherence. Finally, an equation was set up where self-efficacy predicted family efficacy. As seen in Table 8, the first equation was nonsignificant. The second equation was significant and suggests an interrelationship between family efficacy and adherence. The third equation was also significant, suggesting an interrelationship between youth’s self-efficacy for diabetes and family efficacy. The final equation in the mediational analysis could not be examined, however, due to the insignificant relationship between youth’s self-efficacy and adherence.

Discussion

The purpose of the present study was to examine the utility of illness-specific social learning variables and more general family systems variables for predicting adherence and metabolic control in youths with IDDM. Social learning theory proposes that illness-specific psychosocial factors are of primary importance because they are proximal to the desired behavioral and physical outcomes. In the current study self-efficacy, and collective or family efficacy were investigated as important contributors to adherence behaviors and metabolic control. Alternatively, family systems theorists contend that the family system in which the child is based is the most useful context within which to understand behavior (Minuchin, Baker, Rosman, Liebman, Milman, & Todd, 1975). Thus the current study also investigated the quality of family relations (e.g., cohesion and adaptability) as predictors of outcome for children and adolescents with
diabetes. The interrelationships between social learning and family systems variables were also examined, as well as the mediating role of family efficacy.

The hypothesis that youths’ self-efficacy, family efficacy, and family cohesion and adaptability would independently account for a significant proportion of the variance in adherence was not supported in the current investigation. Results indicated, however, that youth’s self-efficacy for diabetes and family efficacy emerged as significant predictors of overall adherence, which included the multiple components (e.g., glucose testing, dietary behaviors, and hypoglycemia preparedness) of the treatment regimen for diabetes. Youth’s self-efficacy accounted for only one percent of the variance in adherence and thus, although statistically significant, it is not likely of practical utility. These findings suggest, however, that, given the complex nature of the diabetes regimen, it might be expected that children’s perceived self-efficacy could be instrumental in determining self-management behaviors.

Moreover, family efficacy accounted for a significant proportion of the variance in adherence, in the direction that suggests that higher family efficacy is associated with better adherence to the treatment regimen for diabetes. While individual perceptions of competence may be necessary, managing diabetes may also be partially explained by perceptions of the family’s collective competence. According to Zaccaro and colleagues (1995), collective efficacy represents “a sense of collective competence shared among individuals when allocating, coordinating, and integrating their resources in a successful concerted response to specific situational demands” (p. 309). Thus, in the context of the family, positive outcome may be dependent on how well the family can coordinate and combine their resources to achieve adherence while managing typical family routines. Prior research has demonstrated that individuals’ responses were in part dependent on others’ responses in the social environment (Bandura & Jourden, 1991). The current findings suggest that adherence may be positively influenced by a sense of the family’s concerted effort that contributes to the ability to manage the complex tasks of the diabetes regimen.

Prior to discussing the predictive utility of self-efficacy, family efficacy, and family cohesion and adaptability on metabolic control, the relationship between adherence and
metabolic control (or glycemic control) warrants clarification. Prior inconsistencies in the strengths of the associations between adherence behaviors and glycemic control have most likely reflected differences in the assessment and quantification of adherence behaviors (e.g., Brownlee-Duffeck et al., 1987; Glasgow et al., 1987, Hanson, DeGuire, Schinkel, & Kolterman, 1995). Assessment tools have varied in their format (e.g., logs, interview, direct observation), content (e.g., behavioral domains tapped) and temporal assessment (e.g., days to months). The Self-Care Adherence Interview (SCAI) used in the present investigation represents a subjective appraisal of averaged behaviors occurring over the previous month. Metabolic control reflects an averaged level of blood glucose over a 6 to 8 week period. Prior research (Hanson et al., 1992) has demonstrated that the overall adherence score as well as factor scores on the SCAI have been found to be significantly correlated with metabolic control (-.20 ≤ r ≤ -.28, p < .05), suggesting a significant relationship between adherence and good metabolic control. In the current investigation, overall adherence as well as the factor scores on the SCAI were correlated with metabolic control, (correlations ranging from -.33 ≤ r ≤ -.37, p < .05), and the correlations were stronger than those previously reported. Thus further evidence is provided for the relationship between good glycemic control and overall adherence, dietary behaviors adherence and hypoglycemia preparedness. At a basic level, however, a patient's health is determined by the adequacy of the treatment regimen and, in turn, perfect adherence to an inadequate regimen will not render good metabolic control for the individual with diabetes. Furthermore, an adequate treatment regimen may become inadequate as a consequence of biological or environmental changes; thus changes in the regimen must continually be made in response to the nonstatic factors (Johnson, 1995). Although the correlations between adherence and metabolic control were strong in the present study, the need still exists for further evaluation and development of instruments that capture the complexity and necessary interdependency of adherence tasks for achieving good metabolic control (Hanson et al., 1996).

Results revealed that youths’ self-efficacy, parents’ self efficacy, and family adaptability were all significant predictors of metabolic control. Family efficacy and family cohesion did not serve as significant predictors of metabolic control. Specifically, higher
self-efficacy of the youths in the study significantly predicted lower HA$_{1c}$'s and thus better metabolic control. A prior investigation of the relationship between youths’ self-efficacy and metabolic control also revealed a significantly positive relationship between adolescent girls’ self-efficacy for diabetes and metabolic control, however that same relationship was not demonstrated for adolescent boys (Grossman et al., 1987). There were no differences in the self-efficacy beliefs held by girls and boys in the current study. Although the evidence supports the predictive utility of self-efficacy for metabolic control, a causal relationship between these variables cannot be determined. It is also unclear as to whether the relationship between efficacy beliefs and metabolic control is mediated by yet a third variable.

Parents’ perceptions of their ability to complete necessary diabetes regimen tasks were also found to predict good metabolic control. The current study is unique in that it examined the utility of parental self-efficacy in predicting metabolic control, an objective outcome measure that appears dependent on factors other than just the individual’s behaviors around diabetes. Moreover, the prediction of metabolic control also presupposes adequacy and effectiveness of the treatment regimen as prescribed. Given that changes in the regimen must continually be made in response to nonstatic factors such as biological and environmental changes, the results also suggest that parents’ efficacy beliefs contribute to their ability to make the necessary changes in the treatment regimen on a day to day basis. In turn, a more positive outcome, as measured by glycemic control, results.

Finally, family adaptability also emerged as a significant predictor of metabolic control. The observed positive association between family adaptability and metabolic control supports the view of family systems theorists that structure and organization, in the absence of rigidity, promote positive outcome. These results are also consistent with the findings of Hanson and colleagues (1992) which indicated that high levels of family flexibility were associated with positive dietary adherence for youths with IDDM. Moreover, zero-order correlational evidence from an earlier study completed by Hanson and colleagues (1989) suggested that good metabolic control was associated with family flexibility. Similarly, Cederblad and colleagues (1982) demonstrated that rigidity was
associated with poor metabolic control. It should be noted, however, that other researchers (e.g., Klemp & LaGreca, 1987) have not found such an association and in fact, have demonstrated that a high degree of flexibility was associated with poor metabolic control. Furthermore, given that the variables investigated in the current study only accounted for 22% of the variance in metabolic control, it is suggested that metabolic functioning is a complex outcome of multiple factors, and requires further multivariate research.

In the present study, a significant correlation was found between metabolic control and age of youths. Specifically, older youths evidenced better metabolic control. This finding contradicts previous research which has found that older adolescent age was indirectly linked to poor dietary adherence via family relations (Hanson et al., 1996; LaGreca, 1988). Given the imprecision of the relationship between family adaptability and metabolic control, future research should examine the possible mediating effect of age on the relationship between family adaptability and metabolic control. Moreover, duration of IDDM was significantly correlated with age (.25, $p < .05$), and may also mediate the relationship between family adaptability and metabolic control. In fact, it has been shown that under conditions of short duration of IDDM, high family rigidity/low adaptability was associated with poor metabolic control but that, as the duration of the illness increased, family adaptability was not associated with metabolic control (Hanson et al., 1989). Given the above correlation between age and duration of IDDM, it may be that family relations are the result of normal developmental processes, and that family relations play a less important role in the psychosocial functioning of older youths.

Contrary to the hypotheses of the study, family cohesion did not significantly predict adherence or metabolic control. The lack of significant associations between family cohesion, and adherence and metabolic control might have resulted from the restricted range in levels of family cohesiveness. Fifty-six percent of families were classified in the connected range of family cohesiveness (7% disengaged, 16% separated, and 21% enmeshed). In addition, prior research has suggested that disease duration was indirectly related to dietary adherence via family relations (Hanson et al., 1987). Thus, disease duration may also mediate the association between family cohesion and adherence.
Future research may benefit from a larger sample size which may enhance the variability in measures of family functioning.

The goal of the second aim of the study was to examine the interrelationships between family efficacy and family cohesion. The results suggest that families with high levels of family efficacy also exhibited high levels of family cohesion. Furthermore, there were no significant discrepancies between youths’ and parents’ ratings of family cohesion. Prior research in sports psychology demonstrated that volleyball teams high in collective efficacy about an upcoming tournament were more cohesive than teams who were low in collective efficacy (Spink, 1990). However, the current study is the first to demonstrate that relationship with regard to children with chronic illness and their families. Moreover, groups in which there is complete agreement among members on the degree of group competence may be more cohesive than groups in which members disagree about group capabilities (Zaccaro et al., 1995). Thus, future research may be better able to sort out the relationship between family efficacy and family cohesion if multiple informants of collective efficacy are also utilized.

In the same vein, the use of multiple informants would eliminate the possibility of the relationship between family efficacy and cohesion being the result of the same informant completing both measures. The complexity of the family system cannot be captured with data from only one respondent (Kazak, 1997). The use of multiple informants allows for further examination of interrelationships among family members and may clarify subsystems within the family. Future research based on the present investigation would benefit not only from additional respondents within the family, but also from inclusion of data from persons outside the immediate family, such as health-care providers, school, or other important community members.

Further, given the cross-sectional design of the study, it is unclear whether family efficacy preceded family cohesion, or whether family cohesion contributed to the family’s sense of efficacy for managing the diabetes regimen. However, Zaccaro and colleagues (1995) suggested that cohesion is a consequence of collective efficacy. As such, it is suggested that a strong sense of family efficacy for simultaneously managing diabetes and family routines is associated with higher cohesiveness of the family. Moreover, while self-
efficacy of the individuals is a necessary condition for collective efficacy, it is not sufficient. Thus, the third aim of the study attempted to examine whether family efficacy mediated the relationship between self-efficacy and family cohesion. Due to nonsignificant correlational relationships between parental self-efficacy and family cohesion as well as between youth self-efficacy and cohesion, the mediated relationship could not be tested. However, a strong correlation existed in the current study between parent’s perceptions of self-efficacy and their perceptions of the family’s efficacy or ability to manage diabetes in the context of daily routines (.55, \( p < .01 \)). Thus, parents’ perceptions of their abilities to accomplish diabetes regimen tasks for their child appear to be related to strong beliefs about the capabilities of family members to coordinate and combine their resources to carry out family routines and manage diabetes. The above correlation, although large, still suggests that parental self-efficacy and family efficacy are distinct concepts.

The third aim of the study was to examine whether family efficacy mediated the relationship between self-efficacy and adherence. Again, because significant correlational relationships did not exist between youth self-efficacy and adherence nor between parental self-efficacy and adherence, the mediational effect of family efficacy could not be examined. It should be noted, however, that youth’s self-efficacy had a small but significant relationship with family efficacy (.17, \( p < .05 \)). Specifically, it seems that youths’ self-efficacy for managing the multiple components of the treatment regimen for diabetes may, in part, be linked to the family’s collective competence. Thus, as with parental self-efficacy, it is again suggested that the response of the individual is influenced by responses in the social environment. Moreover, given that this relationship between youths’ ratings of self-efficacy and parents’ ratings of family efficacy, the potential for informant bias is removed.

**Limitations**

The present study is unique in that it considered the roles of self-efficacy and family efficacy in the prediction of self-care behaviors for youths with IDDM. Youths’ perceptions of self-efficacy served as a significant predictor of adherence and metabolic control, however its utility is still somewhat tenuous given the portion of the variance still unaccounted for. Kaley and Cloutier (1984) reported that accuracy of efficacy appraisals
changed with age. Although efforts were made to limit developmental variability in the present investigation by restricting the age range of participants to 11 years to 15 years, Kaley and Cloutier (1984) suggested that the level of precision of self-efficacy predictions on a difficult fine motor task increased in children from concrete to formal operational levels. Thus, self-efficacy predictions for youths with IDDM may vary across development and may, in turn, impact the utility of such measures for predicting adherence and metabolic control. Ideally, longitudinal studies should examine the developmental trajectories of efficacy expectations and accuracy of self-efficacy predictions across the lifespan in multiple domains. Ultimately, such information may better inform interventions for youths with IDDM by providing information for strategies to improve self-efficacy. Moreover, Havermans and Eiser (1991) demonstrated that children with diabetes, although they recognized the potential importance of their behavior for health, were less confident than healthy controls in their abilities to implement the necessary self-care behaviors. Thus, interventions may likely benefit from taking into account developmental variability in perceptions of self-efficacy, as well as strategies for strengthening youths’ confidence for performing adherence tasks.

The relationship between adherence and metabolic control, as well as the implications for intervention, are far from clear. A semi-structured adherence interview, such as the SCAI utilized in the current study, appeared to provide support for a significant relationship between the multiple components of adherence (e.g., dietary adherence and hypoglycemic preparedness as well as overall adherence) and metabolic control. Thus measures such as the SCAI that summarize data over several weeks may be the most appropriate methodology for assessing the relationship between adherence and metabolic control. Moreover, the findings in the present study implied that the prescribed treatment regimens for youths with IDDM were adequate and effective. Given that assumption, assessment of adherence using a semi-structured interview may be improved upon. Specifically, if metabolic control is viewed within a biopsychosocial context, the adherence interview, as suggested by Hanson and colleagues (1996), may benefit from inclusion of self-care behaviors across multiple contexts (e.g., with peers at social events versus with family), multiple scenarios (e.g., when disruptions occur in the daily schedule,
assessment of family dietary behaviors), and socioemotional contexts (e.g., self-care during stressful life events). Moreover, given that the measure of youths’ self-efficacy considers perceived competence across a number of those contexts, self-efficacy may be more likely to account a larger proportion of the variance in adherence if the semi-structured interview is revised.

Furthermore, consideration of adherence behaviors in multiple contexts again raises the issue of the relevance of outcome expectations, as put forth by Bandura’s self-efficacy theory (1977;1986). According to Bandura’s paradigm, behavior change and maintenance are primarily a function of efficacy expectations. However, outcome expectations, or the beliefs one holds about the outcomes that will result from one’s engaging in a behavior, may also contribute to one’s course of action. Although prior research has demonstrated that outcome expectancies added little to self-efficacy in predicting self-care in adults with NIDDM (Kingery & Glasgow, 1989), the construct may have been prematurely discarded as it applies to youths with diabetes. Moreover, the notion that outcome expectations are more relevant to particular components of the treatment regimen has yet to be explored. For instance, adherence to exercise and dietary behaviors for youths with IDDM may be more dependent on outcome expectations given the social implications of those behaviors. In contrast, adherence to regimen behaviors such as testing blood glucose, which may be perceived of as relatively easy to perform regularly, may be less dependent on outcome expectancies. Intervention with youths with IDDM may benefit from clarification of the relationships of efficacy expectations and outcome expectancies on performance of adherence behaviors, as efforts are made to integrate diabetes care into daily life as opposed to self-care being an additional stressor from day to day.

The present investigation is the first to examine the potential utility of collective or family competence for managing diabetes. Family efficacy, as measured by an adapted version of the Family Routines Questionnaire (Jensen et al., 1983), did serve as a significant predictor of adherence. The notion of the family’s perceptions of their collective ability to allocate, coordinate and integrate their resources may ultimately prove to be a key component in the management and overall positive outcome of youths with
diabetes. The current results must be interpreted with caution, however, until the quality of such a measure of family efficacy is further evaluated and established.

In summary, the current study illuminates the utility of both social learning and family systems variables for predicting outcome for youths with IDDM. Thus, interventions that focus solely on one or the other sets of variables will likely not meet the needs of youths with diabetes and their families. Adherence and positive outcome for youths with diabetes require the cooperation and contribution of the family (Anderson et al., 1990). Continual adjustments may necessarily be made in family roles and responsibilities to adapt to the demands of the treatment regimen on the family. Research efforts are needed to address the changing roles and transfer of responsibilities for managing diabetes over the course of development. Thus, longitudinal data are clearly needed to determine the importance of illness specific variables and family relations over time, as well as the changing interrelationships between these variables with development, in order to provide information for the most relevant and efficacious avenues for intervention.

Moreover, given the suggested utility of family efficacy for predicting positive outcome, family-based treatment strategies are indicated. These strategies should focus on enhancing perceptions of all family members’ abilities to assist with the management of diabetes while carrying out daily routines and activities. Future research is necessary to continue efforts to delineate the mediating effects of social learning and family systems variables on outcome. Moreover, future investigations may benefit from broadening the scope of the system, given the interrelatedness of the family with other systems (Kazak, 1997). Thus, peers, social support networks, hospital systems and treatment teams, and schools should be included in efforts to maximize understanding of intervention around issues of adherence and adjustment for youths with diabetes. Given the current atmosphere of rapid change in health-care strategies, a thorough contextual understanding of children, families, and careproviders is essential. Finally, families are very diverse in their composition and functioning. Although participants in the current study were recruited from many locations, the sample was somewhat homogenous with regard to ethnicity and socioeconomic status. The need to increase research on families of varied
ethnic and socioeconomic backgrounds is of paramount importance. Future research will therefore necessarily be specific, creative, and flexible in order to further clarify the relationships between self-efficacy and family factors, as well as plan intervention strategies for youths with IDDM and their families.
References


Appendix A

Tables 1 - 8
<table>
<thead>
<tr>
<th>VAR</th>
<th>Mean</th>
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<th>Min.</th>
<th>Max.</th>
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<td><strong>DV’s</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT</td>
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<td>5.1</td>
<td>15.0</td>
<td>38.0</td>
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<tr>
<td>DIET</td>
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<td>4.2</td>
<td>7.0</td>
<td>23.0</td>
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<td>.8</td>
<td>4.0</td>
<td>8.0</td>
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<tr>
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<td>2.0</td>
<td>7.0</td>
</tr>
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<td>1.3</td>
<td>5.9</td>
<td>10.8</td>
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</table>

CSED = youth self-efficacy for diabetes  
CSEDG = youth self-efficacy for general situations  
CSEDM = youth self-efficacy for medical situations  
CSEDT = youth self-efficacy total  
PSED = parent self-efficacy for diabetes  
FSE = family efficacy  
COH = family cohesion  
ADAPT = family adaptability  
TOT = total adherence  
DIET = dietary behaviors adherence  
GLU = glucose testing adherence  
HYPO = hypoglycemia preparedness  
HA<sub>1c</sub> = metabolic control
Table 2. Descriptive Statistics for Subject Population

<table>
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<tr>
<th>VAR</th>
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<th>SD</th>
<th>Min.</th>
<th>Max.</th>
</tr>
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<td>5.0</td>
<td>11.0</td>
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<td>DIAG</td>
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<td>3.0</td>
<td>14.0</td>
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<td>DUR</td>
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</table>

AGE = age of child; GRADE = grade in school; DIAG = age at illness onset; DUR = illness duration; SES = socioeconomic status
Table 3. Demographic Correlates of Adherence and Metabolic Control

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Total Adherence</th>
<th>Glucose Testing Adherence</th>
<th>Dietary Adherence</th>
<th>Hypoglycemia Preparedness</th>
<th>HA$_{1c}$</th>
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<td>SES</td>
<td>.06</td>
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<td>.05</td>
<td>.23</td>
<td>-.23</td>
</tr>
<tr>
<td>DUR</td>
<td>-.15</td>
<td>.08</td>
<td>-.22</td>
<td>.06</td>
<td>.20</td>
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</table>

HA$_{1c}$ = metabolic control; AGE = youths’ age; SES = socioeconomic status; DUR = illness duration

* $P < .05$
Table 4. Summary of Hierarchical Regression Analysis for Variables Predicting Total Adherence

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>β</th>
<th>Correlation&lt;sup&gt;a&lt;/sup&gt;</th>
<th>sr² (incremental)</th>
<th>p</th>
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<td></td>
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<td>.17</td>
<td>.01</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSE</td>
<td>.07</td>
<td>.22</td>
<td>.30*</td>
<td>.07</td>
<td>&lt; .05</td>
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<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COH</td>
<td>.16</td>
<td>.16</td>
<td>.27</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADAPT</td>
<td>.08</td>
<td>.07</td>
<td>.21</td>
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Total adjusted $R^2 = .08$

CSED = youth’s self-efficacy for diabetes; FSE = family efficacy; COH = family cohesion; ADAPT = family adaptability/flexibility

<sup>a</sup>Correlations between each predictor and total adherence

* $P < .05$
### Table 5. Correlation Matrix of All Variables Relevant to Hypotheses

<table>
<thead>
<tr>
<th></th>
<th>CSED</th>
<th>COH</th>
<th>ADAPT</th>
<th>FSE</th>
<th>PSED</th>
<th>ADH</th>
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<th>ADH-D</th>
<th>ADH-H</th>
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<td>.09</td>
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<td><strong>COH</strong></td>
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<td>.38**</td>
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<td>.23</td>
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<td>.08</td>
<td>.03</td>
<td>.38**</td>
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<td>.24</td>
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<td><strong>PSED</strong></td>
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<td>.08</td>
<td>.19</td>
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<td>.03</td>
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<td><strong>ADH</strong></td>
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<td><strong>HA1c</strong></td>
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</table>

CSED = youth’s self-efficacy for diabetes  
COH = family cohesion  
ADAPT = family adaptability  
FSE = family efficacy  
PSED = parent’s self-efficacy for diabetes  
ADH = total adherence  
ADH-G = glucose testing adherence  
ADH-D = dietary behaviors adherence  
ADH-H = hypoglycemia preparedness  
HA1c = metabolic control

* $P < .05$  
** $p < .01$
Table 6. Summary of HMRA for Variables Predicting Metabolic Control (HA1c)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>β</th>
<th>Correlation&lt;sup&gt;a&lt;/sup&gt;</th>
<th>( r^2 ) (incremental)</th>
<th>p</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>-.38**</td>
<td>.12</td>
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<td><strong>Step 2</strong></td>
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<tr>
<td>PSED</td>
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<td>-.32*</td>
<td>.05</td>
<td>&lt; .01</td>
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<tr>
<td><strong>Step 3</strong></td>
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<tr>
<td>FSE</td>
<td>-.02</td>
<td>-.03</td>
<td>-.15</td>
<td>ns</td>
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<tr>
<td>COH</td>
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<td>.03</td>
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<td>ADAPT</td>
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<td>.05</td>
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</table>

Total adjusted \( R^2 = .22 \)

CSED = youth’s self-efficacy for diabetes; PSED = parent’s self-efficacy for diabetes; FSE = family efficacy; COH = family cohesion; ADAPT = family adaptability

<sup>a</sup>Correlations between each predictor and metabolic control.

* \( P < .05; ** p < .01 \)
Table 7. Intercorrelations between Family Cohesion and, Family Efficacy, and Self-Efficacy.

<table>
<thead>
<tr>
<th></th>
<th>COH</th>
<th>FSE</th>
<th>PSED</th>
<th>CSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>COH</td>
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<td>.14</td>
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<td>FSE</td>
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<td>-</td>
<td>.55**</td>
<td>.15*</td>
</tr>
<tr>
<td>PSED</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>CSED</td>
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<td></td>
</tr>
</tbody>
</table>

COH = family cohesion; FSE = family efficacy; PSED = parent’s self-efficacy for diabetes; CSED = youth’s self-efficacy for diabetes

* $p < .05$

** $p < .01$
Table 8. Intercorrelations between Adherence, Family Efficacy, and Self-Efficacy.

<table>
<thead>
<tr>
<th></th>
<th>ADH</th>
<th>FSE</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ADH</td>
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<td>.30*</td>
<td>.17</td>
</tr>
<tr>
<td>FSE</td>
<td>-</td>
<td>-</td>
<td>.15*</td>
</tr>
<tr>
<td>CSED</td>
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<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

ADH = overall adherence score; FSE = family efficacy; CSED = youth’s self-efficacy for diabetes

* $P < .05$
CURRICULUM VITA
Mary Kristine Lilly

PERSONAL INFORMATION
Date of Birth: March 21, 1969

Marital Status: Single

Home Address:          Work Address:
443 W. Wrightwood Ave, #1112  Children’s Memorial Hospital
Chicago, IL  60614  Dept. of Child & Adolescent Psychiatry #10
Phone: (773) 244-0834 2300 Children’s Plaza
e-mail: MKLILLY@aol.com Chicago, IL  60614-3394
Phone: (773) 880-4842

EDUCATION

Virginia Polytechnic Institute and State University, Blacksburg, VA.
• 1993 - 1995: MS in Clinical Psychology
• currently enrolled in Clinical Psychology doctoral program
• Major Advisor: Jack W. Finney, Ph.D.

University of Virginia, Charlottesville, VA.

CLINICAL EXPERIENCE

7/97 - present: Predoctoral Psychology Internship: Children’s Memorial Hospital, Dept. of Child & Adolescent Psychiatry, Chicago, IL.
Training Director: Karen R. Gouze, Ph.D.
• 4-month rotations through consultation & liaison service, inpatient psychiatric unit, and partial hospitalization program
• 4-month rotations through developmental, neuropsychology and general testing services
• 12-month experience in Child and Adolescent Psychiatry Outpatient Services
• supplemental rotations include: 6-month rotation specializing in diabetes research and clinical care, 3-month rotation on Neonatal Intensive Care Unit, and 3-month rotation in Behavior Therapy Clinic
• additional responsibilities assumed for staff member on maternity leave include: managing research project on PTSD in child and adolescent gunshot victims, participating on Violent Injury Patient Care Team, and providing weekly coverage on the consultation & liaison service
8/96 - 5/97: Clinical Practicum: Psychological Services Center and Child Study Center, Virginia Tech, Blacksburg, VA. Supervisor: Robert S. Stephens, Ph.D.
- completed a 240 hour Clinical Practicum
- training included supervising a junior graduate clinician on the treatment of child client and family, treatment of adult client, and on the assessment of child client
- conducted couples therapy on a weekly basis
- presented clinical cases, and informal seminars on case conceptualization and report writing
- participated in weekly practicum team meetings and individual supervision, and participated in weekly meetings for practicum team supervisors

5/96 - 8/96: Clinical Externship: Brown University Clinical Psychology Training Consortium/Rhode Island Hospital, Providence, RI. Supervisor: Anthony Spirito, Ph.D.
- covered inpatient consultation service to Hasbro Children’s Hospital, participated in Pediatric Sleep Clinic, and carried cases in the Outpatient Clinic
- referral questions included: pediatric sleep disorders, adjustment to chronic illness, Gender Identity Disorder, adjustment to injury, pain management, and anxiety

5/95 - 8/95: Clinical Externship: Kennedy Krieger Institute/Johns Hopkins University School of Medicine, Baltimore, MD. Supervisor: Gina Richman, Ph.D.
- completed a 480 hour Clinical Externship in the Department of Behavioral Psychology, Child and Family Therapy Clinic
- maintained a caseload of 18 outpatients
- duties included evaluation and treatment of child and family clients

- completed psychological evaluation for client
- served as liaison between the legal team and the client
- clarified previous psychological records for legal team
- conducted twice weekly individual therapy sessions with client

- completed a 480 hour Clinical Practicum
- training included assessment and treatment of child clients and adult clients, completion of adult and child psychological evaluations, case presentations, participation in weekly practicum team meetings and individual supervision
- participated in training and implementation of relapse prevention skills with individuals concerned about their consumption of alcohol
8/93 - 5/94: **Clinical Practicum: Psychological Services Center and Child Study Center, VA Tech.** Supervisors: Richard M. Eisler, Ph.D. and Peg Warren Ph.D.
- completed a 240 hour Clinical Practicum
- training included administration and interpretation of intellectual assessment instruments including the WAIS-R, WISC-III, VMI, and Woodcock-Johnson-R achievement tests, assessment and treatment of child and adolescent clients, co-therapist for marital case, case presentation, and weekly practicum team meetings and individual supervision

2/93 - 8/93: **Mental Health Counselor: Lewis-Gale Psychiatric Center, Salem, VA.**
Primary Supervisor: Lee Cooper, Ph.D.
- served as a mental health counselor on the adolescent unit
- duties included case management as well as serving as co-counselor in group, individual, and family sessions
- participated in interdisciplinary treatment team meetings

**RESEARCH EXPERIENCE**

- **10/96:** **Dissertation:** *An Analysis of Adherence in Childhood Diabetes: Social Learning and Family Systems Variables.* Chair: Jack W. Finney, Ph.D.

11/96 - 5/97: **Research Assistant: American Research Corporation of Virginia**
- funded on a Department of Health and Human Services grant
- served as consultant for the Phase II development of a multimedia program for children ages 6 to 10 years of age with asthma

5/96 - 8/96: **Research Assistant: Brown University Clinical Psychology Training Consortium/Rhode Island Hospital, Providence, RI.**
Epidemiology of Symptom Perception in Childhood Asthma
Primary Investigator and Supervisor: Gregory K. Fritz, MD
- funded on a National Institute of Mental Health summer fellowship
- duties included participation in data collection and management at the Texas Asthma Camp for Kids, Tyler, Texas
- coordinated and supervised data entry
- assisted in manuscript preparation

5/96 - 8/96: **Research Assistant: Brown University Clinical Psychology Training Consortium/Rhode Island Hospital, Providence, RI. (con’t)**
Motivational Interviewing and Adolescent Smoking Behaviors
Primary Investigator: Peter M. Monti, Ph.D., Supervisor: Nancy Barnett, Ph.D.
- duties included subject recruitment through Hasbro Children’s Hospital Adolescent Health Clinic
- participated in data collection, including the provision of motivational interviewing or standard care to adolescent smokers
10/95: Master's Thesis: *Psychosocial Predictors of Adherence, School Absence, and Social Development in Children with Asthma.* Chair: Jack W. Finney, Ph.D.

- assisted with preparation of grant proposal for study investigating illness behavior and the utilization of health care by adolescents
- participated in preparation of proposal aimed at testing Protection Motivation Theory for promoting bicycle safety in children
- participated in early stages of graduate student’s dissertation project on unintentional injury in young children of first time mothers
- participated in research team project investigating injury in young children and safety of school playground equipment

5/92 - 9/92: Research Assistant: Department of Psychology, Va. Tech. Supervisor: Joseph A. Sgro, Ph.D. and Department Chair
- completed research study designed to investigate graduation and retention rates of incoming freshmen in the Psychology Department at Virginia Tech
- utilized dBASE IV, Harvard Graphics, and SAS for data collection and analysis
- prepared report and oral presentation that was distributed to the Executive Committee of the Psychology Department at Virginia Tech

8/90 - 5/91: Research Assistant and Project Manager: Department of Psychiatry, UVA. Supervisor: Robert S. Brown, MD
- longitudinal study assessing the effects of a regular exercise regimen on depressed mood in a college student population
- administered baseline and periodic tests of physical fitness, administered pre- and post-test BDI, monitored subjects’ daily records of exercise on a weekly basis, and organized 11 research assistants involved in data collection and analysis

8/88 - 1/89: Research Assistant: Department of Psychology, UVA. Supervisor: Bella M. DePaulo, Ph.D.
- research study designed to investigate nonverbal behavior and self-presentation
- recruited subjects from the undergraduate population, trained confederates involved in the video-taped tasks, administered questionnaires to the subjects on perception and detection of non-verbal cues, and evaluated the effects of non-verbal behavior on subjects’ decision making

**PROFESSIONAL EXPERIENCE**

8/96 - 5/97: Course Instructor: Psychological Disorders of Children, Department of Psychology, VA Tech. Supervisor: Jack W. Finney, Ph.D. and Department Chair
- responsible for teaching course to 55 upper-level Psychology majors
- taught course for two consecutive semesters
8/93 - 5/96: Advisor for Undergraduate Psychology Students: Department of Psychology, VA Tech. Supervisor: Joseph A. Sgro, Ph.D. and Department Chair
- duties included advising undergraduate majors on course work, graduate school, and other career options
- attended seminars regarding requirements for the College of Arts and Sciences and the Department of Psychology
- attended college fairs for high school students as a representative of the Psychology Department at Va. Tech
- coordinated the Psychology Department graduation ceremonies

PROFESSIONAL PRESENTATIONS


GRANTS

**August 1996:** Recipient of American Psychological Association Graduate Student Travel Award for the 104th Annual Convention of the APA

**September 1994:** Recipient of Graduate Research Development Project (GRDP) grant to fund Master's thesis study

PUBLICATIONS


**PROFESSIONAL AFFILIATIONS**

Association for the Advancement of Behavioral Therapy, Student Member

American Psychological Association, Student Affiliate