Psychosocial Predictors of Adherence, School Absence, and Social Development in Children with Asthma

by

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(ABSTRACT)

The current study was designed to test the utility of a multivariate model to predict adherence to the prescribed medical regimen, absenteeism, and participation in organized activities for children with asthma. The model included health status factors as well as psychosocial predictors (mother and child psychological and cognitive characteristics) and family functioning. Three dependent variables were used including physician estimates of adherence, absenteeism (partial and whole days for the current year), and participation in physical and social activities. Multiple regression analyses were performed to determine whether health status, child and mother psychosocial factors, and family factors would account for significant proportions of the variance in adherence, school absence, and participation in physical and social activities. Results indicated that family factors contributed significantly to the prediction of adherence to the medical regimen. Predictors of absenteeism included the child’s perceived self-efficacy and adherence, and significant predictors of participation in physical and social activities included health status and maternal external locus of control. Suggestions for revising the model and recommendations for future research utilizing the model are included.
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# Table of Contents

Review of Literature ........................................................................................................... 1
  Childhood Asthma ........................................................................................................... 3
  Psychosocial Factors Associated with Outcome ......................................................... 10
Methods ............................................................................................................................... 16
  Subjects ........................................................................................................................... 16
  Assessment Procedure .................................................................................................... 17
  Measures of Predictor Variables .................................................................................... 18
  Measures of Outcome Variables .................................................................................... 25
Results ................................................................................................................................. 26
  Hypotheses ....................................................................................................................... 26
  Data Analysis ................................................................................................................... 27
Discussion ............................................................................................................................ 30
Summary and Suggested Revisions ................................................................................... 35
References ............................................................................................................................. 42
Appendices
  A. Model Diagrams .......................................................................................................... 49
  B. Tables ............................................................................................................................ 52
  C. Questionnaires ............................................................................................................. 65
Curriculum Vita ..................................................................................................................... 66
List of Tables

Table 1. Demographic Variables for Total Sample
Table 2. Summary Statistics of Predictor and Outcome Variables
Table 3. Correlation Matrix of Predictor and Outcome Variables
Table 4. Blockwise Analysis for Outcome Variable Adherence
Table 5. Correlation Matrix for Outcome Variable Adherence
Table 6. Blockwise Analysis for Outcome Variable Absenteeism
Table 7. Correlation Matrix for Outcome Variable Absenteeism
Table 8. Blockwise Analysis for Outcome Variable Participation in Activities
Table 9. Correlation Matrix for Outcome Variable Participation in Activities
Table 10. Correlation Matrix for Outcome Variables
Table 11. List of Predictor and Outcome Variable Abbreviations
Epidemiological data indicate that approximately one in ten children in the United States will be diagnosed with one or more chronic medical conditions by 18 years of age, and that the incidence of chronic illness in the child population may be as great as 14% (Hobbs, Perrin, & Ireys, 1985). Furthermore, it has been estimated that these children comprise approximately 50% of pediatric practice (Magrab & Calcagno, 1978). As a result of 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 toward models that take into account coping resources and the individual competence of the child in managing the illness (Eiser, 1990; Potter & Roberts, 1984).

Recent years have seen enormous growth and reconceptualization in approaches to understanding the impact of chronic illness on children and their families. However a thorough understanding of the psychosocial and environmental variables that contribute to a child's vulnerability are yet to be well understood (Eiser, 1990). To date, intervention services for chronically ill children have been inadequate. Despite medical advances and considerable improvements in prognosis, living with a chronic illness has resulted in previously unforeseen problems including disruptive behavior, nonadherence to treatment regimens, depressive symptoms, anxiety, poor socialization with peers, and high rates of school absenteeism (Carson, Counsil, & Schauer, 1991; Celano & Geller, 1993; Lemanek, 1990; Weitzman, Walker, & Gortmaker, 1986).

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). However, failure to adhere to medical regimens is a well documented but poorly understood health-related phenomenon. Differential rates of nonadherence to prescribed medical regimens have been reported, with estimates ranging from 20-30% for short-term
medical regimens, 30-40% for curative regimens, and as high as 50% for adult and pediatric populations for both acute and chronic conditions (DiMatteo & DiNicola, 1982; LaGreca 1988, Litt & Cuskey, 1980). Adherence has been defined differentially by researchers but the majority of definitions include the extent of concordance between patient behavior and medical recommendations or fulfillment of a clinical prescription (DiMatteo & DiNicola, 1982; Haynes, 1979). However, divergent definitions remain, even with regard to the components of the same medical regimen. The semantics of adherence also differ including terms such as compliance, obedience, and therapeutic alliance being used interchangeably (DiMatteo & DiNicola, 1982). Some have argued that adherence is the most appropriate term because it implies the necessity of active participation of the patient in treatment and has less authoritative connotations. High rates of non-adherence have prompted physicians, psychologists, and health educators to develop strategies to increase adherence in chronically ill children.

Numerous assessment methods and treatment strategies have been either proposed or directly used to assess and to improve adherence in children with chronic illness. The assessment and measurement of adherence may include a variety of direct and indirect methods for evaluating medication use. Such indirect methods include: self-report, therapeutic outcome, parent monitoring, clinical outcome, pill counts, and physicians' estimates of adherence (Epstein & Cluss, 1982; Heerman & Wills, 1992; Lemanek, 1990). Furthermore, more direct methods include ascertaining the presence and level of a prescribed medication in the patient's system through blood/serum assays, urine assays, and tracer methods (Epstein & Cluss, 1982; Lemanek, 1990). Each method has advantages and disadvantages, and therefore the use of multiple measures is recommended in order to obtain a valid assessment of adherence.
A variety of methods are currently used to increase adherence to medical regimens, including: information and instruction, reduction of barriers to compliance, behavior modification approaches (e.g., self-management strategies), increased patient supervision, compliance reminders, and parental administration (Epstein & Cluss, 1982; Haynes, 1979). Epstein and Cluss (1982) concluded, following a review of the various approaches, that behavioral interventions were among the most effective for improving adherence. Such interventions include self-monitoring of medication, reinforcement for symptom control, self-management techniques, decreasing the complexity of medication regimens, and increased patient/physician interaction (Creer, 1991; Epstein & Cluss, 1982). With advances in medical technology and treatment procedures, as well as an active role being played by the patient and his/her family, chronic illnesses can potentially be controlled. However, despite such advances, children with chronic illnesses remain vulnerable in terms of physical health, behavioral, social, and emotional maladjustment. It is therefore crucial that the problem of nonadherence and the variables (e.g., psychosocial, family variables) associated with adherence behaviors are identified. The goal of psychologists addressing chronic illnesses in children is to enhance the therapeutic benefits of treatment methods and interventions.

Childhood Asthma

Asthma is a chronic disorder of the tracheobronchial pathway in which there is recurrent, at least partially reversible (airways may revert to normal either spontaneously or after treatment) generalized obstruction to the airflow. It is commonly manifested by cough and expiratory distress and often expiratory wheezing. However overt wheezing does not have to occur, and the major manifestation may be a cough (Pearlman, 1984). Defining asthma to the exclusion of all other types of respiratory disorders has proven almost impossible. Furthermore, Renne and Creer (1985) pointed out that there is no
standard way to classify patients as having mild, moderate, or severe asthma or a given attack as mild, moderate, or severe. The signs or symptoms of asthma are equally varied and include trouble breathing, chest pain, neck-throat tightness, and fatigue (Lemanek, 1990). In addition, most attacks suffered by asthmatic children occur on an intermittent basis and may be endemic to a given season (Creer, Harm, & Marion, 1986). Therefore, individualized treatment must be expected in treating a child diagnosed with asthma (Heerman & Wills, 1992).

Asthma is one of the most prevalent chronic illnesses found in children (Heerman, & Wills, 1992; Wilson, Mitchell, & Rolnick, 1993), and an estimated one in 15 children in the United States suffers from asthma (Carson, Council, & Schauer, 1991). The age of onset is usually between 3 and 8 years and occurs most often in preadolescent boys (American Lung Association, 1975). More specifically, asthma affects an estimated 7-8% of children 6-11 years of age (Gergen, Mullally, & Evans, 1988). The prevalence, morbidity, and mortality of childhood asthma has increased dramatically in the last two decades (Celano & Geller, 1993; Wigal, Creer, Kotses, & Lewis, 1990; Wilson et al., 1993). Although asthma-related deaths are low compared to the number of deaths from other illnesses (e.g., cancer), the mortality rate may be as high as 1 to 2% (Strunk, Mrazek, Fuhrman, & LaBrecque, 1980). No clear cut evidence has emerged for why the number of deaths from childhood asthma is increasing (Wigal et al., 1990).

The variables involved in the pathogenesis of asthma can be divided into three categories (Reed & Townley, 1983): stimuli (e.g., respiratory infection, irritants, exercise and cold air, emotional response), variables linking stimuli to responses (e.g., immunological pathways, nutritional influences, genetic pathways), and physical responses (e.g., bronchial inflammation, smooth muscle spasm). Such a classification does not presume causes and mechanisms of the disorder. Rather it is a multifactorial approach
which provides part of the foundation for planning optimal treatment for the individual child with asthma.

In the past the diagnosis of asthma has often been based on patient reports; however, with medical advances, more objective methods of diagnosis have proven more accurate. In confirming the diagnosis of asthma, the patient participates in a bronchial challenge which involves inhaling minute quantities of stimuli thought to produce smooth muscle hyperreactivity of the airways (Creer et al., 1986). Following the induction of the challenge, changes in the respiratory functions of the patient are assessed using a spirometer which provides a graphic record of forced expiration. Such a procedure for determining the presence of asthma has provided for more consistent diagnosis across laboratories (Creer et al., 1986).

Adherence

The medical management of asthma involves pharmacological and behavioral recommendations to both prevent and control asthma attacks. However management is hindered by failure to adhere to the prescribed regimen. Failure to adhere to medical regimens has been called the best documented but least understood health-related behavior. Nonadherence rates for long-term regimens and for pediatric populations has been estimated to be at about 50% (Lemanek, 1990). Specifically, studies on the medical management of asthma have reported nonadherence to be from 17 to 90% in children and adolescents (Creer et al., 1986). A review of the medical management of asthma is needed to better understand the obtained non-adherence rates.

The medical management of asthma involves self-management which includes daily administration of such drugs as theophylline to prevent the occurrence of asthma attacks. In addition, other medications such as beta-adrenergic inhalers are used as needed to control acute asthma attacks, and injections of epinephrine and oral ingestion of
corticosteroids are usually given in emergencies or in severe cases of asthma. Behavioral recommendations include avoidance of allergens and irritants and the use of moderate exercise.

Diverse assessment methods related to adherence have been employed to ultimately reduce the morbidity of asthma in children. Such direct methods of assessment include: biochemical assay of blood/serum samples either alone or in combination with saliva samples, and the addition of a tracer to theophylline-based compounds. While blood/serum assays may be the most direct method of assessing adherence, they still provide only a yes/no answer and do not measure erratic usage or reduction in adherence with time (Lemanek, 1996). The two indirect methods most related to medication adherence have been self- or parent-monitoring of medication taking (e.g., frequency, dose) and asthma attacks (e.g., frequency of wheezing, precipitants), and pill counts recorded by parents or physicians (Baum & Creer, 1986). Self-monitoring and pill counts are, however, subject to falsification and may, therefore, overestimate adherence (Epstein & Cluss, 1982). The accuracy of both methods seems to be enhanced if validity checks of the behaviors being monitored are conducted by a caregiver (Baum & Creer, 1986).

Aside from those methods, pulmonary function tests of central airway obstruction have been increasingly performed using peak flow meters. Although such measurements have been demonstrated to be objective indices of pulmonary functioning, the meters are extremely effort-dependent and require proper use for reliable measurements to be obtained.

In general, the goal of adherence is to control asthma symptoms and to maximize, although not necessarily normalize, pulmonary functioning. However, poor rates of adherence to the prescribed regimen have been shown to be responsible for a great deal of the physical and social morbidity associated with asthma (Rubin, Bauman, & Lauby,
1989). Many educational programs have been developed in the past decade to enhance adherence to the prescribed regimen (Creer et al., 1986; Rubin et al., 1989). Although such programs have been shown to improve children's and parents' knowledge about asthma and self-management skills, the overall impact on reducing morbidity has been small (Carson et al., 1991; Howland, Bauchner & Adair, 1988; McNabb, Wilson-Pessano, & Jacobs, 1986; Rubin, Leventhal, Sadow, Letovsky, Schottland, Clemente, & McCarthy, 1986; Rubin et al., 1989).

The morbidity and mortality due to asthma are considered largely avoidable in light of medical care advances. However, deficiencies in management behaviors and nonadherence to the prescribed recommendations play a significant role in excessive morbidity and mortality of children with asthma (Lemanek, 1990; Wilson et al., 1993). Adherence to medical regimens is more often the exception rather than the rule (Creer, 1991). The importance of adhering to the prescribed medical regimens is highlighted by the negative consequences such as exacerbation of symptoms, denial of illness, depressive symptoms, anxiety, poor behavioral adjustment and possibly death that have been associated with high rates of morbidity in children with asthma (Celano & Geller, 1993; Davis & Wasserman, 1992; Rubin et al., 1989; Weitzman, 1986). Furthermore, children with asthma may suffer from a number of functional impairments. Acute exacerbations of the symptoms (e.g., wheezing and coughing) may lead to restricted physical activity, school absence, impaired physical conditioning, and/or avoidance of certain social activities (Celano & Geller, 1993). The two areas most clearly impacted by asthma are school functioning and family income (Creer, 1982). Specifically asthma is a leading contributor to school absence and can severely restrict a child's participation in school-related activities (Lemanek, 1990).
School Absenteeism

School absenteeism represents a significant academic and social problem in the US educational system. Approximately 75% of all school absences are reported to be illness related (Basco et al., 1972). Given that a relationship between somatic complaints and absenteeism has been documented by Basco and others (Weitzman et al. 1986), a question that now needs to be addressed is what factors can help explain this relationship. One obvious factor is that the child has a verifiable chronic illness; asthma continues to be the leading cause of school absences attributed to a chronic physical disorder (Gergen & Weiss, 1990). However, in a study by Weitzman et al. (1986) it was found that not only physical problems but also mental health problems of students and their families were the primary contributing reasons in 50% of the cases. Because school absence patterns established in early grades generally persist throughout the school years, they are of critical importance. Therefore, school absence may serve as a meaningful marker for psychological and psychosocial problems (e.g., family dysfunction) and poor coping with or inappropriate response to illness. In turn, regular school attendance suggests an ability to compensate for the illness and utilize residual skills (Weitzman, 1986).

Weitzman et al. (1986) found that excessively absent students and their family members identified health problems as the primary reason for the absences. Interestingly, however, health interventions using "medically mediated interventions" did not result in a significant reduction in absentee rate. Weitzman concluded that other demographic and educational factors of the students were more influential in their absenteeism as opposed to unmet health needs. Furthermore, several researchers have found that children with psychological and psychosocial problems were absent more often than children without such problems (Adelman, Nelson, & Barker, 1993) and more than children with chronic health problems (Weitzman, et al., 1986). Similar results have been found in primary
health care settings. In fact, some empirical studies have found that actual health needs account for less than one-sixth of the variance in primary care use (Levy, 1980; Riley, Finney, Mellits, Starfield, Kidwell, Quaskey, Cataldo, Filipp, & Shematek, 1993). In turn, school officials could inadvertently be contributing to excessive absences by overlooking the psychological sequelae of high absence students, e.g., children with asthma who also contend with negative psychological and psychosocial factors.

Other studies indicate that the identification of students with high absence rates can aid in the identification of families in need of health services (Boardman et al., 1975). It has been reported that family members of students with excessive absence reported twice as much serious chronic illness as did families in a low absence group. Family competence has also been negatively associated with school absence. It has been shown that problems related to family dysfunction (e.g., parental alcoholism) and psychopathology were related to high absence rates. While it is recognized that parental psychopathology contributes to excessive school absence, the proposed model is limited in that it does not focus on the unique contributions of psychopathology to excessive absence. This study will concentrate on identification of the parent, child, and family variables with relation to health locus of control, self-efficacy, parental encouragement of illness behavior, and family functioning that contribute to school absenteeism in children with asthma.

School absence rates deserve to be more broadly emphasized in research on chronic illness in childhood; school attendance data are relatively easy to obtain and analyze, and the implications of excessive school absence for children's academic performance, social adjustment, and ultimate capacity to function in society is great (Weitzman, 1986). School absence rates reflect many aspects of children's health status'
and have been shown to be responsive to interventions with children with various physical and mental health problems.

**Psychosocial Factors Associated with Outcome**

The literature reviewed above suggests the importance of psychosocial factors for adherence and school outcomes in children with asthma. While parent and child behaviors are clearly implicated in adherence to the prescribed medical regimen for children with asthma, identifying those variables that contribute to adherence warranted further investigation. Beyond the previously demonstrated contribution of knowledge to adherence, the current study was designed to test a number of psychosocial variables representing several domains. Guided by a conceptual framework based on social-learning theory, variables were selected on the basis of their potential for intervention at multiple levels (e.g., child, family, school) and in multiple settings (e.g., school, organized social and physical activities, and physician’s office). A brief review of psychosocial constructs as they relate to adherence and school outcome is summarized below followed by specific indices of these constructs that were used in the current study.

**Child Variables Associated with Outcome**

**Health Locus of Control**

Research on patient adherence has suggested that other factors may be as, or more, important than knowledge in explaining compliance with medical regimens (Rubin et al., 1989). For example, health locus of control has been studied, primarily in relation to adults, as a predictor of initiating and maintaining health behaviors (Wallston & Wallston, 1981). Locus of control refers to an individual’s beliefs about the origins of his/her situation (Thompson, Webber, & Berenson, 1988) and the expectancy that one’s behavior either is or is not directly related to one’s outcomes (Wallston & Wallston, 1981). In relation to health, individuals with an external locus of control are presumed to have
generalized expectancies that the factors that determine their health are ones over which they have little control (luck, chance, powerful others). In turn, "health internals" believe that one stays or becomes healthy or sick as a result of his/her own behavior. According to Rotter (1968) and Parcel and Meyer (1978), those who believe that their actions are effective in influencing their health are more likely to engage in recommended health behaviors than those who believe their health is a matter of chance or luck. It may be that children with asthma adopt and maintain appropriate adherence behaviors when they have a strong internal health locus of control.

A previous investigation by Heerman and Wills (1992) of the moderating influence of internal health locus of control (HLOC) on improved asthma control revealed a significant interaction between low internal parents receiving problem solving instructions and improvement of asthma control. Low internal parents appear to be more amenable to suggestions about improving problem solving skills than are high internal parents. Furthermore, no shift toward internality in either parents' or children's HLOC was found, contrary to studies that have reported an increase in internality for both children and adults following health education programs (Hindi-Alexander & Cropp, 1984; Howland et al., 1986). Finding no shift toward internality in either parents' or children's HLOC may be the result of only one, relatively brief experience in using the cognitive strategy designed by Heerman and Wills (1992). The generalized expectancies of HLOC dimensions are theorized to develop through a number of experiences in given situations (Lewis, Morisky, & Flynn, 1978). In addition, other confounding variables may have been present such as the variability in age of the children and thus their level of cognitive development (Heerman & Wills, 1992). Research that addresses health locus of control of chronically ill children, specifically children with asthma, and its relationship to adherence to the prescribed medical regimen, and, in turn, to school absenteeism is scarce. It is
recommended that future studies focus on how variables such as overall adjustment, locus of control, and knowledge are interrelated (Rubin et al., 1989).

**Perceived Self-Efficacy**

Motivation is, to an extent, a function of the attitudes and expectations of patients. If they believe that adhering with a medical regimen will lead to improved health, they are likely to adhere; if they believe otherwise, they are likely to be nonadherent (Creer, 1991). However, motivation and an individual's confidence in being able to have desired effects on his/her surroundings (sense of efficacy) is the least understood component for the management of childhood asthma.

It has been suggested that an individual's sense of efficacy enhances self-esteem and favors effective adaptation (White, 1979). Bandura (1977) proposed the concept of perceived self-efficacy as central to what he called a unifying theory of behavioral change. He used the term *efficacy expectation* to define one's belief that he/she can successfully execute the behavior required to produce the outcome. To the extent that one's efficacy views shape behaviors in diverse situations, the domain of childhood resilience is one that can benefit from a general measure of children's perceived self-efficacy (Cowen, Work, Hightower, Wyman, Parker, & Lotyczewski, 1991). A protective factor that may be associated with resilience in children confronted with multiple and chronic life stressors is the child's belief in his/her own self-efficacy (Rutter, 1987). Therefore, children with asthma who have stronger self-efficacy views may be better adjusted and more likely to adapt appropriate adherence behaviors than asthmatic children with a low sense of self-efficacy. In fact, Clark et al. (1988) found perceived self-efficacy of children with chronic disease to have some predictive value for self-management, a crucial component of adherence. Furthermore, Mesters et al. (1993) found that parental self-efficacy and illness management behaviors improved significantly after participation in an education program.
for parents of preschool children with asthma. It is now necessary to assess the effects of perceived self-efficacy of parents, in conjunction with that of children, on the development of children's adherence to the prescribed medical regimen for asthma and, in turn, their school attendance and psychosocial development.

Mother and Family Variables Associated with Child's Outcome

Illness Behavior Encouragement and Family Functioning

As children progress in the rapid development of abilities to think, understand, reason, and subsequently make informed decisions about their behavior, various family contextual factors may impinge upon this development in either a positive or negative manner. As with the attainment of other developmental milestones (e.g., social, motor, and emotional development), the development of health and illness attitudes and behaviors cannot be separated from the context in which they occur.

Illness episodes are important socializing events for children (Parmelee, 1986); they provide opportunities for children to learn about health and illness and to develop strategies for coping with physical discomfort. Little is known, however, about the developmental processes that influence the establishment of patterns of illness behavior in children. There is some evidence that general child-rearing practices may be important in the socialization of illness behavior (Parmelee, 1986). Beyond child-rearing practices investigations have moved toward focusing specifically on how parent-child interactions that occur in the context of child illness may influence children's behavior when ill (Walker & Zeman, 1992). Parent-child interactions that occur during the course of minor illness treated at home constitute the primary locale for socializing illness behavior in most children (Parmelee, 1986).

It has been postulated that social learning of sick role behavior begins in childhood. More recent investigations have examined family modeling and reinforcement of illness
behavior, and it was shown that adolescents who did not cope well with chronic pain had mothers who were significantly more likely to exhibit behavior that discouraged the adolescent's efforts at coping with an exercise task (Dunn-Grier, McGrath, Rourke, Latter & D'Estaous, 1986). Furthermore, Rickard (1988) found that children of chronic lower back pain patients exhibited a higher frequency of behaviors hypothesized to be learned through observation of and interaction with a chronic back pain parent than children of healthy parents. Results of these studies provide support for a social learning perspective on the development and maintenance of excessive illness behavior in children.

Socialization experiences are likely to have an effect on a child's subsequent experiences with somatic sensations including utilization of health care facilities and school health clinics (Maddux, Roberts, Sledden, & Wright, 1986; Melamed & Bush, 1985). In addition to being a discriminative stimulus for symptom reporting, the parent has substantial authority to sanction the sick role. That is, parents help determine whether or not a child adopts the sick role and how long he/she assumes that role (Melamed & Bush, 1985). Children with asthma traditionally encounter a developmental stumbling block that results from parents of these children being overprotective (Creer, 1994). According to Walker and Zeman (1992) mothers are more likely to reinforce the sick role of the child than are fathers. Therefore, this suggests that it is important to consider maternal variables when assessing illness behavior in children and when delivering interventions.

Walker and Zeman (1992) considered factors that may account for variation in parent encouragement of children's illness behavior. The nature of the child's illness was also considered as a factor in varying parent encouragement of children's illness behavior. Judgments of the seriousness of an illness are thought to affect expectations of the sick person, and may influence the extent to which parents encourage children to adopt the sick role. Thus, when children's symptoms are regarded as more serious, one would
expect greater parental encouragement of sick role behaviors such as depending on others and relief from routine responsibilities (Walker & Zeman, 1992). Because asthma is a chronic illness, it can be expected that parents of children with asthma more often encourage the child to assume the sick role. In turn, such encouragement does not advocate self-management, a key component of adherence, of asthma by the child; it promotes dependency as opposed to a sense of self-efficacy. Furthermore, due to inappropriate health beliefs (e.g., the need to keep the child out of school for a headache) or the parent's perception that the child is excessively vulnerable, many chronically ill children appear to miss much more school than can be attributed to the functional limitations imposed by the illness itself (Weitzman, 1986).

Undoubtedly, asthma can be disruptive for the parent-child relationship; parents may become hypervigilant and overprotective and may inadvertently reinforce unwanted behaviors (Davis & Wasserman, 1992). A maladaptive parent-child interaction may develop when a parent feels guilty about a child's distress and, fearing a full blown asthma attack, becomes ineffective in response to a child's normal crying reaction to frustration (Weinstein, 1987). The parent may therefore be reinforcing the child's crying and asthmatic symptoms. Furthermore, an atmosphere of panic may develop when there is a change in asthma severity so that attacks no longer correspond with the expectations of the child and the parent. In turn an asthma attack is likely to be inaccurately treated and, for example, if a mild attack is treated as severe, the child's parent may maintain an overprotective attitude toward the child (Renne & Creer, 1985).

The literature summarized above suggests that a more comprehensive investigation of child and family factors is necessary to account for differential outcomes in adherence, absenteeism, and social functioning of children with asthma. Assessing relevant child variables in addition to family and maternal factors may reveal the socialization
experiences that are associated with children who not only miss more school than their healthy peers, but also miss more school than can be attributed to illness alone. Psychosocial measures for the current study were chosen to address what factors predict adherence to the medical regimen for asthma, what factors predict school absenteeism, and what factors predict participation in organized social and physical activities. See Appendix A for a diagramatic representation of the models used to predict outcome.

Methods

Subjects

A description of the current study and an invitation to participate was distributed to the parents of all children in grades 2-5 (ages 8-12 years) by way of letters sent home with each child in the local county as well as three surrounding counties. The efforts of local physicians, allergists, and lung specialists were utilized, information was mailed to children involved in asthma camps affiliated with the American Lung Association, and a free seminar was held for parents of children with asthma to improve subject recruitment. In addition, announcements were published in local newspapers and a special report about the project was aired on the local evening news. As an incentive to participate, all subjects were paid five dollars. It was required that all subjects have a confirmed physician's diagnosis of asthma.

Appointments were scheduled at the Child Study Center or in the home of the participant if that was preferable. Because there is some evidence to suggest that mothers reinforce illness behavior more than do fathers (Walker & Zeman, 1992), only mothers were utilized in order to limit variability due to the gender of the parent completing the self-report measures. Participation required approximately one hour, and at the time of the appointment subjects and their mothers were administered or completed questionnaires described below.
Descriptive Data

Descriptive data for the participants and their families are presented in Table 1 of Appendix B. The sample included 35 children in grades 2-5 who represented ten public schools and one private school from the local and surrounding counties. Each child had previously been diagnosed with asthma although announcements were distributed to all children in the appropriate age/grade range. Table 1 indicates that the majority of the children who comprised the sample were Caucasian and came from predominantly two-parent homes. Of the four children who were not Caucasian one was African American and three were of Indian descent. The mean Hollingshead rating was 51.4 (SD = 12.31) which is indicative of a largely middle to upper middle class sample with regard to income and education. The mean age of participants was 9.8 and the mean grade level was the fourth grade. There were 12 female participants and 23 male participants, which is indicative of the higher prevalence rates in preadolescent boys as reported by the American Lung Association (American Lung Association, 1975). The demographic characteristics of the current sample are similar to those of other samples of children with asthma (e.g., predominantly Caucasian males from middle to upper middle class backgrounds) recruited from community pediatric practice settings (MacLean et al., 1992). There has been some variability in race, SES, and gender reported when participants were recruited from school settings (Parcel et al., 1979). Typically subjects are recruited based on a diagnosis of asthma and although the subject populations have varied in terms of demographic factors, most studies have found no relationship between outcome (e.g., adherence) and age, sex, race, and family status (Lemanek, 1990).

Assessment Procedure

High rates of school absence in chronically ill children can be attributed to both health and non-health related factors. Therefore each parent and child was assessed on
global components that were hypothesized to be related to adherence to the prescribed medical regimen. Nonadherence can exacerbate poor functioning (e.g., social adjustment) in children with a chronic illness. The primary components assessed were: 1) health status of the child, 2) psychosocial status of the child, 3) psychosocial status of the mother, and 4) overall family functioning with regard to health management.

Informed consent was obtained from each parent in order to gain access to the child's school attendance records for the current school year. Consent was also obtained for the child's medical records in order that physician estimates of asthma severity and adherence could be received. Furthermore, aspects of the study that involved the children were explained to them, assent was obtained, and all self-report measures were verbally administered.

**Measures of Predictor Variables**

Predictor variables were categorized into 4 components with regard to the first hypothesis, and 5 components with regard to the second hypothesis according to conceptual fit. Measures that comprised each component are summarized below.

**Component 1 - Health Status**

**Clinical Severity of Asthma.** Previous studies of the covariation of psychological adjustment with illness severity have provided mixed results (Perrin, MacLean, & Perrin, 1989). Although children with severe illness generally have lower levels of psychological adjustment than children with milder disease, the relation between illness severity and adjustment is not necessarily linear. For example, children with moderate asthma severity had more optimal psychological adjustment than children with mild or severe asthma (Perrin et al., 1989). Severity of illness is just one of the factors that influences the psychological adjustment of children with asthma, and was assessed based on parent and
physician ratings. Both parents and physicians were asked to rate the child’s asthma severity on a 10 point Likert scale, 1 being not severe and 10 being very severe.

Components 2 and 3 - Psychosocial Status of Child and Mother

Illness Behavior Encouragement Scale (IBES) (Walker & Zeman, 1992). The IBES is a 24-item verbally administered measure that has parallel parent-report and child-report forms. It assesses the parent’s encouragement of the sick role and reinforcement of illness symptoms as well as the child’s perceptions of whether such encouragement and reinforcement exist. The IBES represents a modified version of the Illness Reinforcement Scale for adults (Whitehead et al., 1986) and has acceptable psychometric properties. Construct validity of the measure has been demonstrated by correlation of the IBES and other measures of child illness behavior. A modified version of the scale was used in order to specifically assess parent encouragement of asthmatic symptoms and the child’s perceptions of such encouragement; a total IBES score was obtained by summation of the items and can range from 0 to 48. The higher the score, the greater the reinforcement/perceived reinforcement of asthma symptoms.

The subjects used in the development of the IBES consisted of pediatric patients with a variety of minor physical complaints; children with a chronic illness or handicapping condition were excluded. Significant positive correlations between mother and child total IBES scores were reported, \( r = 0.39, p<0.01 \) (Walker & Zeman, 1992). Both the parent form which has a mean of 34.96, SD = 14.42 and the child form which has a mean of 35.77, SD = 15.30 were modified and used for children with asthma. In the current study, the means and SD’s for the parent and child forms were 16.86 (SD=8.49) and 19.77 (SD=8.88), respectively. The large discrepancy between the means and SD’s found in the current study and those found when the IBES was developed with pediatric patients with minor complaints (e.g., cold symptoms) may suggest that there is something unique about
mothers’ tendency to encourage illness behavior in children with chronic illness. The intermittent nature of asthma symptoms and attacks may result in distinct coping styles of parents and children. Little is known about how parents may modify their behavior toward their children as a function of the nature of the child’s illness, and further investigation of the IBES with children with chronic illness is warranted. In addition, while the original sample was 72% female, the present study consisted of only 34% females, and the discrepancy between the means of the two samples may reflect gender differences in sick role behavior. Walker and Zeman (1992) reported child gender differences for the original sample; girls reported more parent encouragement of illness behavior than did boys, suggesting that girls are more likely than boys to expect positive consequences such as special attention and relief from responsibility during illness episodes. Previous literature has shown differences in parenting styles for sons and daughters, and parents have been found to encourage boys to develop independence, whereas girls are given more protection and reassurance (Lewis, 1987). A significant positive correlation between the mother and child total IBES scores was also found in the current study, \( r = .40, p < .05 \), indicating that a mother and child have similar perceptions of family interactions during episodes of the child’s asthma. It is also probable that mothers and children influence each other’s behavior reciprocally during episodes with asthma.

Multidimensional Health Locus of Control (MHLC) Scales revised by Thompson, Butcher and Berenson (1987). The MHLC Scales were revised by Thompson et al. (1987) in order to be used with elementary school children as well as adults. It is an 18-item self-report measure based on three distinct dimensions of locus of control, internality, chance externality and powerful others externality, grounded in Levenson's (1974) contention that health locus of control is not unidimensional. The
MHLCS scale is designed to assess the extent to which one believes that his/her health is controlled internally (e.g., self-care, preventative measures), by chance (e.g., luck), or by powerful others (e.g., parents, physicians). Item responses are based on a four point Likert scale with regard to what extent the individual agrees or disagrees with a given statement; scores on the internality subscale range from 5 to 20, scores on the chance externality subscale range from 7 to 28 and scores on the powerful others chance externality scale range from 6 to 24. It has been shown that the revised MHLCS scales can be used to obtain reliable and valid data from children with regard to health locus of control (Thompson, Butcher & Berenson, 1987; Thompson, Webber & Berenson, 1987 & 1988). Test retest reliability coefficients for internal, chance, powerful others, and total scores are .62, .80, .59, and .77, respectively. The three factor structure provided evidence of the construct validity of the scale, although three items loaded significantly on unexpected factors. Scores are obtained by summing the ratings for all items on each factor; the higher the score, the stronger the locus orientation. All three factors were used in the current study.

**Perceived Self-Efficacy (PSE) measure for children (Cowen, Work, Hightower, Wyman, Parker & Lotyczewski, 1991).** The PSE measure is a 20-item self-report measure with adequate internal consistency and test-retest reliability (Cowen et al., 1991). It has been suggested that an individual’s confidence in being able to have desired effects on surroundings (sense of efficacy) enhances self-esteem and favors effective adaptation (White, 1979). Efficacy ratings correlated significantly with self-rated school adjustment, social skills, realistic control expectations, positive coping styles and perceived confidence in school work and behavioral conduct (Cowen et al., 1991). Scores range from 20 to 100 with higher scores indicating a stronger sense of perceived self-efficacy.
Self-efficacy Scale (Sherrer, Maddux, Mercandante, Prentice-Dunn, Jacobs, & Rogers, 1982). Self-efficacy theory asserts that personal mastery expectations are the primary determinants of behavioral change. The Self-efficacy Scale, to be utilized with mothers, yields two subscales: a General Self-efficacy subscale (17 items) and a Social Self-efficacy subscale (6 items). On the scale, subjects rate agreement with each item on 5-point Likert scales ranging from "disagree strongly" to "agree strongly"; the higher the score, the higher are self-efficacy expectations. The scores on each subscale are determined by summation, scores on the General Self-efficacy subscale range from 17 to 85 and the scores on the Social Self-efficacy subscale range from 6 to 30. The mean score on the General subscale is 172.65, SD=27.31 and the mean score on the Social subscale is 57.99, SD=12.08. Reliability and validity of the subscales has been demonstrated to be adequate (Sherer et al., 1982; Sherer & Adams, 1983). Only the scores from the General Self-efficacy subscale were used in the current study.

Asthma-Specific Self-efficacy Scale. A self-efficacy measure designed to assess maintenance of asthma regimen behaviors as a function of one's expectations about one's ability to perform behaviors, and expectations about outcomes that will result from performing such behaviors was administered. Both a parent and a child were developed for the current project. Efficacy expectancy scores are derived by simply totaling the individual item scores on the measure (items 1 - 12). To derive outcome expectancy scores, items 13 and 14 are added together. A score combining efficacy and outcome expectancy is calculated by multiplying the totals derived for each of the measures as suggested by the model proposed by Bandura (1977). The measure was administered to each mother and child, and the scores combining efficacy and outcome expectancy were used for the analysis.
Exploratory factor analysis with oblique rotation was performed on the 14 items from the Asthma Specific Self-efficacy scale (ASE-P, ASE-C) separately for the parent and child forms. Two factors were extracted for both the child and parent measures. For the child measure, items loaded differentially based on whether it was a time specific item (e.g., “How likely is it that you will be able to take your pills like the doctor told you to for at least 1 month”) or a scenario item (e.g., “If something comes up when you are about to take your medicine, for example your favorite TV show starts, how likely are you to remember to take it afterwards?”). Both of the outcome expectancy items (13 and 14) loaded on the same factor, however they had the smallest loadings of all items and are not distinguishable from efficacy expectancy items (1 - 12) for children. It is therefore recommended that item 14, the item with the weakest loading, be removed in future versions of the instrument. Coefficient alpha is equal to .839 for the measure and would increase to .848 with item 14 removed.

For the parent measure, items again loaded differentially based on whether it was a time specific item (e.g., “How likely is it that your child will be able to take his/her pills like the doctor told him/her to for at least 1 month”) or a scenario item (e.g., “If something comes up when your child is about to take his/her medicine, for example a favorite TV show starts, how likely are you to remind him/her to take it afterwards?”). Both of the outcome expectancy items (13 and 14) loaded on the same factor, however they were again not distinguishable from the efficacy expectancy items. Coefficient alpha for the parent measure is only .60 and is considered unacceptable. It is recommended that caution be used before revising and/or using the parent measure again due to the possibility that it may combine both the parent’s perceptions of the child’s efficacy as well as the parent’s perceptions of his/her own efficacy.
Component 4 - Family Factors

Family Environment Scale (FES; Moos & Moos, 1986). The FES is a 90-item self-report instrument designed to assess social-environmental characteristics of families. The instrument yields 10 subscales consisting of 9-items each that tap the domains of relationships, personal growth and system maintenance. The entire instrument was completed by each mother, however four subscales of family functioning have been shown to be particularly relevant to health issues in families and were used in the current study. The four subscales used were: Cohesion (the degree of commitment, help, and support family members provide for one another), Conflict (the amount of openly expressed anger, aggression, and conflict among family members), Expressiveness (the extent to which family members are encouraged to express their feelings directly), and Organization (the degree and importance of organization and structure in planning family activities and responsibilities). Respondents report whether they agree or disagree that items describe their family. The FES has been shown to have reliable subscales and to distinguish between disturbed and normal family populations. Standard scores for the four subscales were used in the current analysis.

Component 5 - Adherence

Estimates of Adherence. Each mother was asked to keep a two week diary in order to record the frequency and dose of the prescribed medication that the child took based on the medication regimen prescribed by the physician. In addition, the child’s physician rated their estimation of the child’s adherence to the medical regimen on a 10 point Likert scale, 1 being not adherent and 10 being very adherent. Due to the majority of participants taking medications on an as needed basis, it was not feasible to use the parent reports of adherence in the current analysis. Therefore the physician’s ratings were utilized.
Measures of Outcome Variables

Adherence

In the first analysis, adherence served as the outcome variable and was measured as described above. Therefore only the first four components previously described were used to predict adherence to the medical regimen. In the additional analysis, adherence was used as a predictor to determine whether it contributed uniquely to the variance in school absence and participation in social and physical activities.

School Absence Rates

The total number of school absences for each child was obtained for the entire school year in which the current study was conducted. An absence from school was defined as either missing an entire day or missing the morning or afternoon of a school day. Both excused absences related to illness reports and unexcused absences (e.g., truancy, suspension) were recorded.

Participation in Physical and Social Activities

The Daily Activity Scale (DAS; Smith, Gotlieb, Gurwitch, & Blotcky, 1987). The DAS was developed to assess the amount of time in hours children spend in physical, social, and self-engaged activities on a specified day. Each mother was asked to complete the scale about the child's activities during the course of one specific day on two occasions (during the administration of the self-report measures and 2 weeks later). Three examples are listed under each category of activity to help define of demonstrate the general activity area for the mother. Under "social activity," the three examples include time spent in an organized sport such as scouts, time spent in play with one friend or sibling, and time spent with one or more adults. Three scores are obtained by summing the time spent in each major category of behavior. In the analysis, the average score for time spent engaged in social and physical activities was used.
The DAS was previously used to assess the daily activity level of eighteen pediatric cancer patients, and results of that investigation indicate that the mean time spent engaged in social activities was 4.00 hours (SD=2.6), and the mean time spent engaged in physical activities was 3.72 (SD=2.4). In the current study, the means and SD’s for time spent engaged in social and physical activities are 4.24 (SD=2.9) and 6.84 (SD=3.02), respectively. Although the average time spent engaged in social activities is comparable between the original study with pediatric oncology patients and children with asthma in the current study, the differences in time spent engaged in physical activities is quite discrepant. Such a discrepancy may be indicative of a difference, as yet undefined, between children with a chronic illness such as asthma and children with cancer. The difference may also be attributable to the disproportionately large number of males in the current study compared to the relatively equal distribution of males and females in the study with pediatric cancer patients. Further investigation using the DAS is thus warranted. Appendix C provides a listing of all questionnaires used in the current study.

Results

Hypotheses

1) In a sample of elementary school children, health status (Component 1), child and mother psychosocial variables (Components 2 and 3), and family factors (Component 4) will independently account for a significant proportion of the variance in adherence.

2) In the same sample, health status (Component 1), child and mother psychosocial variables (Components 2 and 3), family factors (Component 4), and adherence (Component 5) will independently account for a significant proportion of the variance in school absence and the child's level of participation in social and physical activities.
Data Analysis

The data were analyzed with SPSS version 6.0 (SPSS Inc., 1993) for Windows. Hierarchical regression analyses were performed to test the hypotheses with each dependent variable (adherence, school absence, and participation in social and physical activities). Because the dependent variables were conceptually related, individual multiple regression tests were performed to control for experimentwise Type I error.

A procedure that was hierarchical over blocks and stepwise within blocks was utilized. The independent variables that remained in the regression equation were selected stepwise within each one of the components. Variables entered the regression based on the criterion of the probability of $F = .10$, and each variable in the equation was examined for removal based on the criterion of the probability of $F = .15$. Variable selection terminates when no more variables meet entry and removal criteria. Table 2 depicts summary statistics for each predictor and outcome variable used in the study.

The independent variables were analyzed by component using a blockwise regression analysis procedure (Pedhazur, 1982); blockwise regression is a conservative procedure that was used in an effort to control for Type I errors because of the large number of independent variables relative to the size of the sample. Blockwise regression analyses were completed for each dependent variable with all components entered hierarchically into the equation based on a theoretical conceptualization with regard to which components were considered to be most important in predicting outcome. A correlation matrix for all variables contained in the study is presented in Table 3.

Regression Results

Adherence

Hierarchical regression was employed to determine if health status, child and mother psychosocial variables, and family factors independently accounted for a significant
proportion of the variance in adherence. Table 4 summarizes the results of the hierarchical regression over the four blocks, and displays the unstandardized regression coefficients (B), the standardized regression coefficients (β), the semipartial correlations (sr²), and adjusted R² after entry of all blocks. Table 5 shows the correlation matrix for variables retained in the model. The results indicate that 22% of the variance was predicted with one block (2 variables). The family factors block accounted for the variance; family cohesion (FESCOH) accounted for 15% of the variance and organization (FESORG) accounted for an additional 7% of the variance in adherence. Both cohesion and organization were positively related to adherence. The family factors block was the last one entered into the regression, and none of the blocks entered prior to it (e.g., Health Status, Child and Mother Variables) were significant.

**School Absence**

Adherence was used as an additional independent variable in the analysis of school absence. Thus, hierarchical regression was employed to determine if health status, child and mother psychosocial variables, family factors, and adherence independently accounted for a significant proportion of the variance in absence. Table 6 summarizes the results of the hierarchical regression over the blocks, and displays the unstandardized regression coefficients (B), the standardized regression coefficients (β), the semipartial correlations (sr²), and adjusted R² after entry of all blocks. Table 7 shows the correlation matrix for variables retained in the model. The results indicate that 47% of the variance was predicted with two blocks (1 variable from each of the two components). Predictors comprising the child variables block accounted for 37% of the variance in school absence with the child’s perceived self-efficacy (PSE) emerging as the only significant predictor; PSE was inversely related to school absence. When adherence (ADH) was added to the equation an additional 11% of the variance in school absence was predicted; adherence
was also inversely related to absence. The health status, mother variables and family factors components were not significant.

**Participation in Social and Physical Activities**

Adherence was also used as an additional independent variable in the analysis of participation in social and physical activities. Thus, hierarchical regression was employed to determine if health status, child and mother psychosocial variables, family factors, and adherence independently accounted a significant proportion of the variance in participation in activities. Table 8 summarizes the results of the hierarchical regression over the blocks, and displays the unstandardized regression coefficients (B), the standardized regression coefficients (β), the semipartial correlations (sr²), and adjusted R² after entry of all blocks. Table 9 shows the correlation matrix for variables retained in the model. The results indicate that 33% of the variance was predicted with two blocks (1 variable from each of the two components). Predictors comprising the health status block accounted for 25% of the variance in participation in activities with the physician’s rating of asthma severity emerging as the only significant predictor; severity was inversely related to participation. When the mother variable component was added to the equation an additional 8% of the variance in participation in activities was predicted with the mother’s external locus of control related to powerful others (LOCPO) emerging as the only significant predictor. LOCPO was also inversely related to participation in activities. The child variables, family factors, and adherence components were not significant.

A correlation matrix for all outcome variables contained in the study is presented in Table 10. In this sample, no demographic variables (e.g., age, gender, race, SES) were significantly related to adherence, school absence, or participation in social and physical activities. Table 11 provides a summary of all predictor and outcome variables and their abbreviations.
Discussion

The current study examined the association between child health status related to asthma and psychosocial variables and adherence, school absence, and psychosocial development in a sample of elementary school children. This study was unique in that it explored variables from several domains including child, mother and family, school, and physician. The selection of predictor variables in the present study was guided by the well established notion that, above and beyond the contribution of health status factors related to having a chronic illness, psychosocial variables contribute to the prediction of child outcomes. This study was aimed at more specifically determining the psychosocial factors of the child, mother, and family that contribute to a more positive outcome for children with asthma. The purpose of this study was to establish the utility of two theoretically derived models that may also be applicable to children with other chronic illnesses and their families.

The results of the current study do not support the hypothesis that health status, child and mother psychosocial variables, and family factors independently account for a significant proportion of the variance in adherence. The results also do not support the hypothesis that each of the above components and adherence independently account for a significant proportion of the variance in school absence and participation in organized activities. The findings do indicate, however, the utility of particular components in predicting adherence, school absence, and psychosocial outcome for children with asthma. Given the small sample size, the components that were not significant should not be prematurely discarded, but rather suggestions for revising the models will be given in order to facilitate future investigations.

For adherence, family cohesion and organization emerged as significant predictors. Specifically, the higher the cohesion (e.g., degree of commitment, help, and support family
members provide one another) and the higher the organization (the degree of importance of clear organization and structure in planning family activities and routines), the more adherent the child was to the treatment regimen for asthma, according to physician ratings. This finding suggests that a family’s ability to establish a supportive environment and to provide structure to manage stressful events (e.g., a child with a chronic illness) may be important components in successfully managing the child’s asthma and improving adherence to the treatment regimen. The factors that enable the family to maintain a high degree of cohesion and structure are best understood in the context of a transactional model that places the child in a dynamic system maintained by bidirectional influences between the child’s and family’s behavior (Fiese & Sameroff, 1989). The experiences provided by the environment are not independent of the child, and transactions may produce adaptive responses in the family that contribute to greater adherence to the medical regimen for asthma. Research with diabetic children has demonstrated that those families engage in more enabling interaction patterns such as problem solving and active understanding than families with an acutely ill child (Hauser, et al., 1986). From a transactional perspective, diagnosis of the child with a chronic illness may influence the mother (who typically takes responsibility for the child’s health care) to become more involved with the child and demonstrate more problem-solving behaviors because she perceives the child as more vulnerable. The child may respond with higher levels of self-initiated problem-solving that may contribute to increased adherence.

The current findings also lend further credence to Kronenberger and Thompson’s (1990) demonstration of the utility of three factors derived from the FES, Supportive, Conflicted, and Controlling, in predicting psychosocial outcome in children with chronic illness. More specifically, the Conflicted factor reflected a dimension of conflict that lacks organization or support (as indicated by family organization and family cohesion) and was
predictive of behavior problems and poor psychosocial outcome in chronically ill children. Caution is advised in this interpretation of the current findings, however, due to the fact that adherence was measured solely on the basis of physician ratings. It may be that families that present to the physician as cohesive and well organized may be perceived by the physician as being more adherent regardless of the family’s actual practices in managing the child’s asthma.

A major challenge exists in the translation of a transactional family model into effective intervention strategies for children with a chronic illness and specifically, children with asthma. It must also be taken into account that the course of the illness (e.g., exacerbation of asthma symptoms) may be affected by family interaction and dynamics. Overall, psychosocial factors did not predict adherence to the extent hypothesized, perhaps because such variables are dynamic and vary with experience and the child’s development. Studies using longer follow-up periods to assess changes in adherence over time should be conducted. Implementing different treatment strategies in diverse settings may also prove to be a feasible and justified approach to improving adherence to the prescribed treatment regimen for asthma. More specifically, educational strategies focused on informing children and their parents about the management of asthma as well as increasing family understanding of verbal and written instructions through improved patient and parent communication with the doctor may contribute to families adopting more appropriate responses to asthma episodes. Behavioral strategies (e.g., medication calendars to provide direct feedback on whether medications were taken appropriately, and written contracts between children and parents with specified rewards and sanctions) in combination with educational strategies likely provide more positive results than any one approach, and may contribute to improved parent-child interactions in response to illness.
With regard to school absence, the child's general sense of self-efficacy, or confidence in being able to have desired effects on his/her surroundings, accounted for the largest amount of the variance (37%) in absenteeism. More specifically, the more efficacious the child perceived him/herself to be, the lower the rate of school absences for the year. This is consistent with literature on healthy children (e.g., children without a chronic illness) that suggests that efficacy is positively correlated with overall school adjustment, rule compliance, social skills, and positive coping styles (Cowen et al., 1991). It may also be the case that a child's belief in his/her own efficacy provides a protective factor associated with resilience in children faced with multiple, chronic life stressors (e.g., having asthma).

In addition, adherence also contributed significantly to the prediction of absenteeism and was inversely related to school absence. Previous literature (Clark et al., 1988) has established that perceived self-efficacy of children with chronic disease has some predictive value for self-management, a crucial component of adherence. Therefore, it seems plausible that children with asthma who have stronger self-efficacy views may be better adjusted and more likely to adopt appropriate adherence behaviors than children with a low sense of ability to produce change in their environment. Although the correlation between the child's perceived self-efficacy and adherence was in a negative direction, it was not significant in the current study. The negative correlation may suggest that children with high perceived efficacy possess other protective factors (e.g., perceived competence, adaptive coping styles), which lead those children to believe that they can manage their asthma symptoms without having to take medication. In other words, it may be that children who generally feel efficacious believe that they can impact their environment to avoid the negative sequelae of asthma instead of taking medication to control asthma symptoms. The other possibility is that, as Cowen et al. (1991) suggest,
the perceived self-efficacy measure may not necessarily reflect all aspects of a generalized self-efficacy construct. The measure may be more specifically related to social coping strategies, and although a relationship between peer acceptance and treatment adherence has been documented (La Greca, 1990), little is known about why socially competent children manage their illness more effectively. Collectively, the child's self-efficacy and adherence to the medical regimen for asthma accounted for 47% of the variance in school absence. Future research should focus on examining the way in which health beliefs (e.g., efficacy) are formed by children and change over time. In addition, the development of more precise measures of the influence of health beliefs of chronically ill children at different ages on subsequent adherence behaviors is needed.

With regard to participation in social and physical activities, significant contributions from the health status and mother variables were found. More specifically, asthma severity (based on physician estimates) was inversely related and accounted for most of the variance (25%) in the child's participation in social and physical activities. Thus severity of asthma symptoms continues to contribute uniquely to the physical and social morbidity associated with having a chronic illness, despite recent medical advances in treatment of asthma. For the mother psychosocial variables domain, having an external locus of control was negatively associated with the child's participation in physical and social activities. Although past literature does not directly assess the impact of a parent's health locus of control on the psychosocial development of the child, the current finding is consistent with the notion that external control perceptions are associated with a less sophisticated understanding of the cause, treatment, and prevention of illness. Taken a step further, it may be that a parent who does not feel able to help treat the child's asthma and or recognize factors that may contribute to asthma symptoms may be more likely to restrict the child's participation in activities in an overall attempt to protect the child.
Summary and Suggested Revisions

In light of the literature suggesting that treatment programs to improve adherence and psychosocial outcomes of children with asthma have been relatively ineffective, the current study attempted to identify important variables to subsequently be included in predictive models and treatment interventions with chronically ill children. Facets of health status of the child, psychosocial characteristics of the mother and child, and family functioning were explored. The results of the regression analyses generally did not support the theoretical models being tested, although several important variables did emerge in the prediction of adherence, school absence, and participation in organized activities. In addition, those variables predicted outcomes in the expected direction. While it is too early to eliminate those variables that did not contribute significantly to the variance in outcome, there are revisions to the models that appear warranted.

The health status component in the current study included both physician and mother estimates of the severity of the child’s asthma. Given a larger and more heterogeneous population, a combination of health status measures should be included. In addition to physician ratings of severity, it would be valuable to include the number of nonemergency and emergency visits that were made to the physician’s office or the emergency room. Peak flow devices are also increasingly recommended as providing an objective index of pulmonary functioning of children with asthma (Creer, 1991). It is suggested, however, that parent estimates of severity not be included in further investigations of the current model as it was not predictive of outcome and is likely to be influenced by other parental factors such as self-efficacy. Beyond physical health status, it would be useful to include a mental health status measure to more adequately address the multicomponent conceptualization of health as including physical, mental, and social well-being.
Both the mother and child psychosocial variables components included a measure of health locus of control (HLOC) which refers to an individual's beliefs about the origins of his/her situation and the expectancy that one's behavior either is or is not directly related to one's outcome. The items on the HLOC scales are specific to the health of the individual completing the measure and it may be that a mother's perception of the control she has over her own health may not be directly related to the child's outcome. Furthermore, research indicates that factor analyses of essentially healthy persons' responses to HLOC items produce different structures than analyses based on responses from chronically ill or patient populations (Wallston & Wallston, 1981). Therefore, although the mother's external locus of control was significantly predictive of the child's participation in organized activities, it is recommended that future tests of the models not include a measure of the parent's HLOC. While HLOC has been studied primarily in relation to adults, the need for research that addresses HLOC of chronically ill children with asthma, and its relationship to outcome, is warranted.

General and asthma-specific measures of self-efficacy were also included in the child and parent components of the theoretical models tested in the current study. Self-efficacy theory asserts that personal mastery expectations are the primary determinants of behavioral change and that a sense of efficacy enhances self-esteem and promotes effective adaptation (Bandura, 1977). Thus the utility in examining the relationship between self-efficacy and adherence and psychosocial outcome is evident. In fact, in the current study, the child's general sense of efficacy had predictive utility for school absence. Furthermore, Bandura's theory of self-efficacy postulates that much of human behavior is developed through modeling and therefore, although neither of the parent measures of self-efficacy emerged as significant predictors of outcome, it is recommended that parent measures of efficacy be retained in the models. Examination of self-efficacy in relation to
outcome for children with asthma is new and, until the psychometric properties are well established for a specific measure of efficacy in relation to asthma, it is important to retain the general measures in the models. Both the current study and a study published since the conceptualization of the current project have utilized newly developed measures of asthma specific self-efficacy and have demonstrated acceptable internal consistencies (Mesters, Meertens, Kok, & Parcel, 1994). Future studies should therefore include these instruments in a further attempt to develop a specific measure with sound psychometric properties.

Illness behavior encouragement and the child's perceptions of such encouragement were included in the child and mother components and were assessed through the administration of the Illness Behavior Encouragement Scale (IBES). Illness episodes are important socializing events for children, they provide opportunities for children to learn about health and illness and to develop strategies for coping with physical discomfort (Melamed & Bush, 1985; Parmelee, 1986). In light of social learning theory as the framework for the development of the IBES, and the notion that parent-child interactions that occur during illness episodes contribute to the socialization of illness behavior in children (Walker & Zeman, 1992), it is essential to retain both the parent and child illness behavior encouragement scales in future tests of the models. Although the IBES data in the current study were not predictive of the child’s outcome, it is expected that the data may be significant given a larger and more heterogeneous sample.

The Family Environment Scale should also continue to be included in the models of adherence and psychosocial outcome of children with asthma. In the current study, family cohesion and organization were positively related to adherence to the prescribed treatment regimen for asthma. While the present investigation examined family conflict, cohesion, organization and expressiveness, a future test of the models would benefit from
examination of the three factors (Supportive, Conflicted and Controlling) derived by Kronenberger and Thompson (1990) that predicted psychosocial outcome in a population of children with chronic illness. Thus it is necessary to continue the empirical and conceptual delineation of dimensions of the family environment using the FES that are most applicable to different types of families (e.g., those with a child who has a chronic illness). In light of the interdependence of the attitudes of children with asthma and their family structure, interventions to improve adherence may not be maximally effective without consideration of family structure.

Revisions to the models with regard to measures of outcome for children with asthma are also appropriate. The number of studies on adherence in children with asthma has grown in recent years, however, poor adherence to medical regimens remains a significant problem and to date it has been difficult to obtain conclusive results that may further the development of effective interventions. In part it has been difficult to obtain more definitive results due to such factors as the variability of symptomatology in type and across time, and the vast array of treatment approaches including both daily medications and PRN medications. Adherence has also been defined differentially across studies, although most definitions include concordance between patient behavior and medical recommendations as crucial components. Furthermore, investigators are yet to reach a consensus on the most accurate method of assessing adherence due to the variety of disadvantages still inherent in commonly used measures. For example, while drug assays are objective in that they do not rely on self- or parent-reports, they are costly, invasive, and provide only a yes/no answer (e.g., do not indicate erratic medication usage or a reduction in adherence over time). Less intrusive measures of assessing adherence, such as pill counts, physician estimates, and patient or parent reports, are therefore frequently utilized. However such indirect measures are often suspect due to the potential for
falsification or overestimation of adherence. Although the current study suggested the importance of adherence in predicting school absence (e.g., the more adherent the child was to the treatment regimen, the less school he/she missed), it must be taken into account that physician estimates were used to measure adherence. As noted earlier, those estimates may not be reliable and may be more reflective of treatment outcome which may not have an exact relationship with adherence. Participating parents in the current investigation also kept a two week diary of their child’s adherence to the prescribed medical regimen, however those reports were not used due to the majority of subjects taking medications on an as needed basis. Future investigations should continue to use multiple measures of adherence as well as to address the psychosocial variables that concurrently contribute to adherence and school absence, in light of the knowledge that the etiology of school absences is multifactorial and reflects behavioral as well as physical phenomena.

School absence in the current study was assessed based on the number of partial and whole school days missed during the school year in which the study was conducted. Due to the variable nature of asthma, it is recommended that, in the future, absence data be collected for a more extensive period of time. Additionally, it may be useful to combine school absence and participation in organized activities into one measure of psychosocial functioning. Such a measure could include not only school absence and participation in social and physical activities, but also an index of academic achievement as well as an assessment of behavioral problems and peer relations. Assessment of psychosocial functioning would be enhanced with the use of the Child Behavior Checklist (CBCL, Achenbach, 1991), and in particular, scores obtained on the three scales (Activities, Social, School) that comprise the Competence Scales.
The generalizability of the results obtained in this study may be limited by several factors including methodological weaknesses. Subject recruitment for the current investigation proved to be highly labor intensive and less fruitful than anticipated. Consequently, the sample size was small and clearly limited the power of the results. Furthermore, the sample used represented a predominantly Caucasian, middle class population and reflects patterns of physician practice rather than a representative sample of all children with asthma. Although attempts were made to recruit participants from the local emergency rooms, none of the subjects were from that setting and thus the possibility exists that children with relatively mild disease may be over represented in this sample.

Significant proportions of the variance in adherence, school absence, and participation in social and physical activities were accounted for by health status, child and mother variables, or family factors. However there are still substantial proportions of unexplained variance for all outcomes. Future examination of the theoretically derived models in the current study should take into account the suggested revisions as well as the necessity of a larger sample.

Efforts at delineating factors influencing outcome in children with asthma should continue to be examined in future research. In turn, effective educational and behavioral treatment strategies to increase adherence and improve psychosocial functioning of children with asthma need to be implemented in a diversity of settings. Adherence to the medical regimen for asthma may include multiple components of self-management such as self-monitoring and instruction to prompt, direct, and maintain use of asthma medication as prescribed. Implementing decision making and problem solving strategies in light of the dynamic nature of the family may enable children and their parents to generate alternatives and perform appropriate behaviors to improve psychosocial development of children with asthma.
Clearly the need exists for multicenter collaborative research on adherence and psychosocial outcomes in pediatric populations with asthma. Such collaborative work will improve accessibility to the pediatric population and attainability of a suitable sample size, and will ideally expand the current knowledge base with regard to adherence and psychosocial outcome of children with asthma. It is hoped that facets of the current study will be able to be replicated with a larger and more diverse population of children with asthma.
References


Appendix A
Model Diagrams
Predictors of Adherence to the Medical Regimen

Health Status
- Asthma Severity

Child Variables
Health Beliefs
- HLOC
- Self-Efficacy
- Illness Behavior Encouragement

Parent Variables
Health Beliefs
- HLOC
- Self-Efficacy
- Illness Behavior Encouragement

Family Factors
- Family Functioning / Environment

Adherence
Predictors of School Absences and Participation in Social Activities

- Health Status
  - Asthma Severity

- Child Variables
  - Health Beliefs
    - HLOC
    - Self-Efficacy
    - Illness Behavior Encouragement

- Parent Variables
  - Health Beliefs
    - HLOC
    - Self-Efficacy
    - Illness Behavior Encouragement

- Family Factors
  - Family Functioning / Environment

- Adherence

School Absenteeism

Participation in Social Activities
Appendix B
Tables 1 - 11
### Table 1

**Demographic Variables for Total Sample**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
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<td>Age</td>
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<td>1.8</td>
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<td>Grade</td>
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<td>1.6</td>
</tr>
<tr>
<td>Hollingshead Rating of SES</td>
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<td>12.3</td>
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<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Percent %</th>
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<tr>
<td>Race</td>
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<td>caucasian</td>
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<tr>
<td>African American or Indian</td>
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<td>11%</td>
</tr>
<tr>
<td>Gender</td>
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<td></td>
</tr>
<tr>
<td>male</td>
<td>23</td>
<td>66%</td>
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<tr>
<td>female</td>
<td>12</td>
<td>34%</td>
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Table 2

Summary Statistics of Predictor and Outcome Variables

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<th>SD</th>
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<td>8.25</td>
<td>1.08</td>
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<td>399.74</td>
<td>102.94</td>
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<td>ASE-P</td>
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<td>PSE-C</td>
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<tr>
<td>GSE-P</td>
<td>66.49</td>
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<td>LOCIN-C</td>
<td>17.20</td>
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<td>LOCIN-P</td>
<td>18.26</td>
<td>2.56</td>
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<tr>
<td>LOCEX-C</td>
<td>13.69</td>
<td>3.68</td>
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<tr>
<td>LOCEX-P</td>
<td>10.49</td>
<td>3.31</td>
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<td>LOCP-O-C</td>
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<td>4.26</td>
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<td>LOCP-O-P</td>
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<td>FESCOH</td>
<td>57.03</td>
<td>11.16</td>
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<td>FESCON</td>
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<td>FESEX-P</td>
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<tr>
<td><strong>Outcome</strong></td>
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<td>ADH</td>
<td>8.25</td>
<td>1.08</td>
</tr>
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<td>ABS</td>
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<td>TOTACT</td>
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### Table 4

**Blockwise Analysis for Variable Adherence (ADH)**

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<th>BLOCK</th>
<th>VARIABLES</th>
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<th>( \beta )</th>
<th>( sr^2 ) (incremental)</th>
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<td>Health Status</td>
<td>Severity (parent)</td>
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</tr>
<tr>
<td></td>
<td>Severity (physician)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>LOCIN</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOCEX</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOCPO</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
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<td>PSE</td>
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<td></td>
</tr>
<tr>
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<td>IBES</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>LOCIN</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOCEX</td>
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<td></td>
</tr>
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<td></td>
<td>LOCPO</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASE</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
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<td>IBES</td>
<td>ns</td>
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<td></td>
</tr>
<tr>
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<td>0.36</td>
<td>0.372</td>
<td>0.15*</td>
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<tr>
<td></td>
<td>FESCON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FESEXPA</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>FESOG (+)</td>
<td>0.027</td>
<td>0.306</td>
<td>0.07*</td>
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</table>

Cumulative \( R^2 = .22^{**} \)

* \( p < .05 \)

** adjusted \( R^2 \)

(+) (+) direction of the parameter estimate
Table 5

**Correlation Matrix for Variable ADH**

<table>
<thead>
<tr>
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<th>FESCOH</th>
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<tr>
<td>FESCOH</td>
<td>*</td>
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<td>FESORG</td>
<td></td>
<td>*</td>
<td>.37</td>
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<tr>
<td>ADH</td>
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a = p < .05
### Table 6

**Blockwise Analysis for Variable Absence (ABS)**

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<tr>
<th>BLOCK</th>
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<th>( r^2 ) (incremental)</th>
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<td>Health Status</td>
<td>Severity (parent)</td>
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<td></td>
<td>Severity (physician)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>LOCIN</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOCEX</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOCPO</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASE</td>
<td>ns</td>
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<td></td>
</tr>
<tr>
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<td>-.705</td>
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<td>Mother</td>
<td>LOCIN</td>
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<td>LOCPO</td>
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<td></td>
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</tr>
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<td>GSE</td>
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<td>IBES</td>
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</tr>
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<td>Family</td>
<td>FESCOH</td>
<td>ns</td>
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<tr>
<td></td>
<td>FESCON</td>
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</tr>
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<td></td>
<td>FESEXP</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>FESORG</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
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<tr>
<td></td>
<td>(physician rating)</td>
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</table>

Cumulative \( R^2 = .47**

* \( p < .01 \)

** adjusted \( R^2 \)

(\( \dagger \), \( \dagger \)) direction of the parameter estimate
Table 7

Correlation Matrix for Variable ABS

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<td>ADH</td>
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<tr>
<td>ABS</td>
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a = p < .05
Table 8

**Blockwise Analysis for Variable Participation in Physical and Social Activities (TOTACT)**

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<th>VARIABLES</th>
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<th>β</th>
<th>sr² (incremental)</th>
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<td></td>
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<td>Child</td>
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<td></td>
<td>ns</td>
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<tr>
<td></td>
<td>LOCEX</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>LOCPO</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>ASE</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>PSE</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>IBES</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Mother</td>
<td>LOCIN</td>
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<td>ns</td>
</tr>
<tr>
<td></td>
<td>LOCEX</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>LOCPO(+)</td>
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<td>-.324</td>
<td>.08*</td>
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<tr>
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<td>ASE</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>GSE</td>
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<td></td>
<td>ns</td>
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<tr>
<td></td>
<td>IBES</td>
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<td></td>
<td>ns</td>
</tr>
<tr>
<td>Family</td>
<td>FESCOH</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>FESCON</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>FESEXP</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>FESORG</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Adherence</td>
<td>ADH</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(physician rating)</td>
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Cumulative $R^2 = .33^{**}$

* $p < .01$

** adjusted $R^2$

(−), (+) direction of the parameter estimate
Table 9

Correlation Matrix for Variable TOTACT

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<thead>
<tr>
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<th>SEV-PH</th>
<th>LOCPO-P</th>
<th>TOTACT</th>
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</thead>
<tbody>
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<td>SEV-PH</td>
<td>*</td>
<td>-.08</td>
<td>-.35 *</td>
</tr>
<tr>
<td>LOCPO-P</td>
<td>*</td>
<td></td>
<td>-.12</td>
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<tr>
<td>TOTACT</td>
<td></td>
<td></td>
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*p = p < .05*
## Table 10

**Correlation Matrix for Outcome Variables**

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<th>ADH</th>
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</tr>
</thead>
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<tr>
<td>ADH</td>
<td>*</td>
<td>-.22</td>
<td>.26</td>
</tr>
<tr>
<td>ABS</td>
<td>*</td>
<td></td>
<td>-.11</td>
</tr>
<tr>
<td>TOTACT</td>
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<td>*</td>
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</table>

\[ a = p < .05 \]
Table 11

<table>
<thead>
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<th>Abbreviation</th>
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<td><strong>Predictor</strong></td>
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<td>Adherence</td>
<td>ADH</td>
</tr>
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<td>Asthma Self-efficacy (child)</td>
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</tr>
<tr>
<td>Asthma Self-efficacy (parent)</td>
<td>ASE-P</td>
</tr>
<tr>
<td>Perceived Self-efficacy (child)</td>
<td>PSE</td>
</tr>
<tr>
<td>General Self-efficacy (parent)</td>
<td>GSE</td>
</tr>
<tr>
<td>Locus of Control (internal, child)</td>
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<tr>
<td>Locus of Control (internal, parent)</td>
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<tr>
<td>Locus of Control (external, child)</td>
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<td>Locus of Control (external, parent)</td>
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</tr>
<tr>
<td>Locus of Control (powerful others, child)</td>
<td>LOCPO-C</td>
</tr>
<tr>
<td>Locus of Control (powerful others, parent)</td>
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<td>Family Environment (cohesion)</td>
<td>FESCOH</td>
</tr>
<tr>
<td>Family Environment (conflict)</td>
<td>FESCON</td>
</tr>
<tr>
<td>Family Environment (expressiveness)</td>
<td>FESEXP</td>
</tr>
<tr>
<td>Family Environment (organization)</td>
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</tr>
<tr>
<td>Illness Behavior Encouragement (child)</td>
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<td><strong>Outcome</strong></td>
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<td>Adherence</td>
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<td>Absence</td>
<td>ABS</td>
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<td>Participation in Activities</td>
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Appendix C
Questionnaires

Consent forms (parent and child)
Physician Ratings of Severity and Adherence
Illness Behavior Encouragement Scale (Walker & Zeman, 1992)
Multidimensional Health Locus of Control (Thompson, Butcher, & Berenson, 1987)
Perceived Self-efficacy scale (Cowen et al., 1991)
Self-efficacy Scale (Sherrer et al., 1982)
Asthma Specific Self-efficacy Scale (created for current study)
Family Environment Scale (Moos & Moos, 1986)
Daily Activities Scale (Smith et al., 1987)
CURRICULUM VITA
Mary Kristine Lilly

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Date of Birth: March 21, 1969

Marital Status: Single

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EDUCATION

Virginia Polytechnic Institute and State University, Blacksburg, VA
• Fall 1993 - Spring 1995: Completed course work and practicum work toward Master of Science degree in Clinical Psychology. Expected degree date: December, 1995.
• Major Advisor: Jack W. Finney, Ph.D.

Virginia Polytechnic Institute and State University, Blacksburg, VA.
• Fall 1991 - Fall 1992: Completed additional course work in Chemistry, Physics, and Psychology.

University of Virginia, Charlottesville, VA.
CLINICAL EXPERIENCE

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 clientele

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

- completed a 480 hour Clinical Practicum
- training included assessment and treatment of 3 child clients and 3 adult clients (2 individual, 1 marital), completion of two adult and two child psychological evaluations, two 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

candidate.
- 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 2 child clients and 1 adolescent client, co-therapist for 1 marital case, 1 case presentation, and weekly practicum team meetings and individual supervision
2/93 - 8/93: Mental Health Counselor: Lewis-Gale Psychiatric Center, Salem, VA.
- served as a mental health counselor primarily on the adolescent unit
- duties included case management as well as serving as co-therapist in group, individual, and family sessions
- participated in interdisciplinary treatment team meetings

RESEARCH EXPERIENCE

10/95: Master's Thesis: Psychosocial Predictors of Adherence, School Absence, and Social Development in Children with Asthma. Chair: Jack W. Finney, Ph.D.

8/92 - present: Research Assistant: Department of Psychology, Va Tech. Supervisor: Jack W. Finney, Ph.D.
- currently researching unintentional injury in young children of first time mothers
- assisted with preparation of grant proposal for project 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

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

8/93 - present: Advisor for Undergraduate Psychology Students: Department of Psychology, Va Tech. Supervisor: Joseph A. Sgro, Ph.D. and Department Chair

- duties include advising undergraduate majors on course work, graduate school, and other career options
- attend seminars regarding requirements for the College of Arts and Sciences and the Department of Psychology
- attend college fairs for high school students as a representative of the Psychology Department at Va Tech
- transfer students into and out of the Psychology Department coordinate the Psychology Department graduation ceremonies

PROFESSIONAL PRESENTATION


GRANT

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

BOOK REVIEW


PROFESSIONAL AFFILIATION

American Psychological Association, Student Affiliate

Signed: [Signature]
Date: 10/05