A Multimethod Assessment of Behavioral and Emotional Adjustment in Children With Asthma

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Objective: Examine behavioral adjustment and emotion regulation among 6-year-old children with asthma and a group of healthy controls.

Method: Subjects were 81 children with asthma and 22 healthy controls. Asthma and allergy statuses were confirmed by objective measures. Emotional and behavioral functioning were assessed through parent report, child interview, and child participation in an emotional regulation paradigm.

Results: Maternal report revealed more internalizing and total behavior problems for children with asthma compared to controls. Child interview and behavioral observations of emotion regulation yielded no differences between groups. Severity of asthma was related to increased emotional difficulties by clinician interview and observation but not by maternal report.

Conclusions: Two groups of children with asthma who have psychological difficulties include those with increased anxiety and those with poor emotion regulation and more asthma symptoms. Different measures of child adjustment yield a complex picture of the behavioral difficulties associated with pediatric asthma.

Key words: pediatric; asthma; adjustment; emotion regulation; multimethod; illness severity; mother-child interaction.

Decades ago, pediatric asthma was perceived as a psychosomatic illness often characterized by difficulties in mother-child interaction. Advances in understanding the pathophysiology of asthma and documentation of the wide array of precipitating factors gradually tempered this view. However, the question of whether children with asthma have more difficulties in adjustment than other children has yet to be definitively answered. Empirical work investigating behavior problems in the pediatric asthma population has had methodological difficulties and has yielded inconsistent results. Studies that have considered the role of disease severity in relation to adjustment among individuals with asthma have also reported disparate findings. Further, few studies provide a model for explaining why children with asthma would have differing patterns of adjustment.

The goal of this study is to examine the behavioral and emotional adjustment of young children with asthma. We use a multimethod approach to elucidate the inconsistent results of prior research. We review data regarding children’s emotion regulation and propose an alternate framework for ex-
plaining variation in behavioral adjustment in children with asthma.

Psychological Adjustment Among Children With Asthma

Early literature on psychological adjustment in children with asthma often focused on emotional difficulties and disturbed parent-child relationships (French & Alexander, 1941). Perhaps in response to these observations, two classic epidemiological studies investigated the prevalence of psychiatric disorders in children with asthma (Graham, Rutter, Yule, & Pless, 1967; McNicol, Williams, Allan, & McAndrew, 1973). Both studies concluded that the psychiatric disorder or behavioral disturbance found in children with asthma did not exceed that found in children without asthma. However, more recent research efforts have often reported increased levels of behavior problems among children with asthma as compared to children without asthma (Hamlett, Pelligrini, & Katz, 1992; Kashani, Konig, Shepperd, Willley, & Morris, 1988; MacLean, Perrin, Gortmaker, & Pierre, 1992). Different measurement approaches may account for these varying estimates of the prevalence of psychological problems. Research indicating higher levels of psychological problems in children with asthma than in healthy children is derived primarily from parent report data (Hamlett et al., 1992; MacLean et al., 1992). Furthermore, when differences are found, the difficulties reported are generally minimal and fall in the range between normal behavior and diagnosable disorder (Kashani et al., 1988).

Studies that obtain information about child functioning from informants other than the parents are less consistent regarding increased levels of psychopathology in children with asthma. In the study by Graham and colleagues (Graham et al., 1967), teachers did not report higher levels of behavior problems among children with asthma. In a more recent study including both parent and child structured interviews, findings indicated children with asthma did not differ from matched controls in number or type of psychiatric diagnoses (Kashani et al., 1988). However, parents of children with asthma reported higher levels of overanxious symptoms for their children than parents of controls. No group differences were found on levels of symptoms by child interview (Kashani et al., 1988).

Hence, the finding that children with asthma have increased behavior problems relative to their peers appears to derive specifically from parent report measures. Parents tend to report higher levels of behavior problems for children with asthma; other informants (teachers and the children themselves) rarely report such differences. Recent research has emphasized the need for utilizing multiple informants in any assessment of child behavior problems, given that parents, children, and other adults may all provide unique perspectives on child functioning (Achenbach, McConaughy, & Howell, 1987; La Greca & Lamanek, 1996).

Illness Severity and Psychological Functioning Among Children With Asthma

Findings have been contradictory as to whether increased asthma severity is related to increased difficulties in emotional and behavioral adjustment. Early research suggested that behavioral disturbances occurred at a significant level only in the small group of children with severe and continuing asthma (Graham et al., 1967; McNicol et al., 1973). Some recent studies have found greater asthma severity to be associated with increased adjustment problems (Bussing, Halfon, Binjamin, & Wells, 1995; MacLean et al., 1992) and more difficulties in the mother-child relationship (Hermanns, Florin, Dietrich, Rieger, & Hahlweg, 1989). This pattern is consistent with reports of high levels of psychiatric disorder among adolescents with very severe asthma (Wamboldt, Weintraub, Krafchick, & Wamboldt, 1996). However, others have found no relationship between asthma severity and psychological functioning (Kashani et al., 1988). Yet others have found a curvilinear effect, with the greatest psychological dysfunction occurring among children with both severe and mild asthma (Perrin, MacLean, & Perrin, 1989).

Asthma severity is a complex construct defined by dimensions such as symptom frequency and severity, response to treatment, and effect of the illness on life activities. Inconsistent results regarding the relationship between children's psychological functioning and asthma severity may be caused, in part, by variations in assessment. Objective indices such as measures of lung functions may be included, but most psychological studies rely on reports of medications required to control asthma symptoms, frequency and severity of symptoms, or functional indices such as school days missed. Several studies that have used medication level as a measure of asthma severity have found no relation-
ship to psychological adjustment (Kashani et al., 1988; Norrish, Tooley, & Godfrey, 1977). In contrast, asthma severity measures that include functional status items such as number of school days missed have more frequently been related to psychological problems (Graham et al., 1967; MacLean et al., 1992). This may be true because the management of asthma, including the extent to which it negatively affects children’s functioning, is associated with psychological functioning (Stein & Jessop, 1984). Finally, number and severity of symptoms, in isolation from medication levels required, might be expected to be related to psychological functioning because the latter is related to compliance (Milgrom, Sarlin, & Leung, 1994). In this study, we have distinguished between medication level and symptom control to clarify the potentially differing relations between these variables and child adjustment.

Emotion Regulation in Children With Asthma

We propose that difficulties in emotional regulation may provide a useful heuristic for understanding the behavioral and interactional difficulties reported in children with asthma. The process of emotional regulation includes access to the range of emotions and the flexible modulation of the intensity, duration, and transitions between emotions (Cole, Michel, & O’Donnell Teti, 1994). Developmentally, emotion regulation is influenced not only by intrinsic factors such as temperament but also by repeated interactions with caretakers. The manner in which caretakers modulate emotions for their young children and teach (e.g., through modeling or providing consequences) the regulation of emotional behavior has been shown to play a major role in children’s emotion regulation (Thompson, 1991). Events that stress the child and caretakers, such as when young children develop significant illness, may contribute to dysregulatory aspects of emotional regulation that may impede adaptive coping; emotional and behavioral difficulties may then result.

The examination of emotion regulation among children with asthma complements the measures provided by behavioral ratings. Assessments of emotion and emotion regulation focus on the key areas of behavior that often have been described, through a variety of measures, as problematic for individuals with asthma. Emotional symptoms such as anxiety or depression (Kashani et al., 1988; Wamboldt et al., 1996) and parent-child interaction problems (Block, Jennings, Harvey, & Simpson, 1964; Hermanns et al., 1989; Mrazek, Anderson, & Strunk, 1985; Schobinger, Florin, Zimmer, Lindemann, & Winter, 1992) may be reinterpreted as difficulties in emotion regulation. In this view, negative emotion may disrupt the child’s internal equilibrium as well as the relationship with the parent. Such difficulties in the parent-child relationship can result in the negative emotional climate noted in certain observational studies of children with asthma (Block et al., 1964; Mrazek et al., 1985) and may also result in increased parental report of some child behavior problems (Hamlett et al., 1992; MacLean et al., 1992).

Method

Sample

Eighty-one children with asthma and 22 healthy control children between the ages of 6 and 7 were enrolled in the study. Participants were recruited through physician referrals from the community, outpatient and inpatient services at the National Jewish Medical and Research Center, responses to community advertisements, and participation in a longitudinal study cohort (Mrazek, Klinnert, Mrazek, & Macey, 1991). All of the healthy controls were recruited from the latter cohort. Forty-three (42.6%) of the total sample were girls. The children’s ethnic background was 70% Caucasian, 14% Mexican American, 11% African American, 3% American Indian, and 2% Asian. The groups of children with and without asthma were comparable in terms of ethnic background, $\chi^2 (4) = 4.03$, ns. The average socioeconomic level was middle class, with 20% Level I, 33% Level II, 25% Level III, 12% Level IV, and 11% Level V (Hollingshead, 1975). There was no difference between the socioeconomic levels of the children with asthma and those without, $\chi^2 (4) = 7.19$, ns.

Asthma and Allergy Status

Children were recruited into the study on the basis of parent report of the presence or absence of asthma symptoms. All children received methacholine challenges to confirm the diagnosis of asthma. A positive response to inhaled methacholine was defined as a decrease in lung function (FEV1) from
baseline of at least 20% and/or clinical signs and symptoms at 10 mg/ml administration (Adinoff, Schlosberg, & Strunk, 1988). Children with asthma who did not demonstrate a positive response to methacholine were excluded from the study, with the exception of those who were currently taking inhaled corticosteroids (Bel, Timmers, Zwinderman, Dijkman, & Sterk, 1991) and had documentation of wheezing episodes by medical record review. Children who presented with a history of bronchopulmonary dysplasia in infancy \((n = 2)\) or who presented with cough variant asthma with no clinical evidence of wheezing \((n = 8)\) were also excluded.

Clinical classifications of asthma severity were made by an allergist who reviewed the medical history and clinical presentation. Medical history review included assessment of the frequency of asthma exacerbations and examination of the medication regimen. Pulmonary function data and clinical observations from the methacholine challenge were also reviewed. Classification of asthma severity was made according to the levels provided by the National Asthma Education Program: Expert Panel Report (National Asthma Education Program, 1991). Of the 81 children with asthma, 27 (33%) were judged to be in the mild range, 46 (57%) in the moderate range, and 8 (10%) in the severe range.

We wanted a continuous measure of asthma severity so that we could use information contained within the broad categories of mild, moderate, and severe in our examination of psychological correlates. In addition, we wished to weight similarly the pattern of high medications/low symptom score (controlled, adequately treated) asthma and the pattern of low medication/high symptom score (out-of-control, inadequately treated) asthma. Children with high medications/high symptoms would receive scores reflecting the most severe asthma. Thus, we developed a continuous measure of asthma severity, which included information regarding medication level and symptom control. To derive a scale of severity of required medication, an allergist rank ordered the medication regimens of the children in the study along a dimension of medication severity. The same procedure was followed to derive a scale of symptom control, so that children with infrequent, milder symptoms received lower scores and children with severe symptoms requiring hospitalizations and/or emergency department visits received the highest scores. The two scales were correlated at \(r = .49\) and were combined in order to achieve our goal for similar weight for the two patterns. An analysis of variance (ANOVA) was computed on the severity scores with three levels of asthma severity to determine whether children’s scores on the continuous severity scale were consistent with the physician-rated severity level. The highly significant ANOVA, \(F(2, 78) = 20.16, p < .0001\), indicated high agreement between the two dimensions of asthma severity. Analyses presented here of associations between psychological factors and asthma severity use the continuous scale.

We determined allergic status for both children with asthma and those without through a review of allergy symptom history and results of prick skin testing to a panel of 22 regional aeroallergens. Sixty-six (60%) of the children were judged as allergic and 37 (40%) as not allergic. For the children with asthma, a comparison between allergic and nonallergic groups on illness severity was not significant, \(t(78) = 1.21, ns\).

**Procedures**

The study protocol was approved by the National Jewish Institutional Review Board. Children came to the laboratory with their mothers on two occasions. Mothers completed the Child Behavior Checklist (CBCL; Achenbach, 1991) for their children before the first visit. The purposes and procedures of the research project were described to the mothers and children during the first laboratory visit. Informed consent was obtained from the mothers, and informed assent was obtained from the children. Mothers were then interviewed regarding their child’s asthma and allergy history while the child was interviewed by a child clinician using the Semi-structured Clinical Interview for Children and Adolescents (SCICA; McConaughy & Achenbach, 1994). The clinician was unaware of the child’s asthma status and any extensive background or history of behavioral functioning. Following the interviews, the child received prick skin testing. Antihistamines were withheld prior to skin testing.

During the second laboratory visit, we assessed the child’s emotion regulation by engaging him or her in a series of tasks designed to elicit a variety of emotional states (as described below). After the individual child tasks were completed, the mother joined the child for two final tasks. Following the laboratory assessment, the child was taken to the
pulmonary function laboratory for a bronchial challenge to methacholine to determine airway reactivity.

**Measures**

*Child Behavior Checklist.* We used the Child Behavior Checklist (CBCL; Achenbach, 1991) to obtain parental report of the child’s behavioral functioning. Parents read a list of 113 behaviors (e.g., “has nightmares”) and indicate on a 3-point scale the degree to which the behavior is typical of the child. Scores result in several empirically derived scale scores, as well as broadband Internalizing, Externalizing, and Total Behavior Problem scores. This measure was recently revised to make it a more appropriate tool for use with a chronically ill population and to provide more recent norms (Achenbach, 1991).

*Semistructured Clinical Interview for Children and Adolescents.* Children were interviewed by a child psychology doctoral candidate, trained by the PI in the use of the Semistructured Clinical Interview for Children and Adolescents (SCICA; McConaughy & Achenbach, 1994). During this interview, developed for children ages 6 to 18, the child is asked questions about the general areas of school, friends, family, relatives, fantasies, and self-perceptions. Brief assessments of academic achievement, fine motor skills, and gross motor skills are also obtained. In addition, the interviewer receives a list of six behaviors that the parent has identified as problematic while filling out the CBCL to use to probe the child’s perception of these difficulties. After the interview, the clinician scores the child’s behaviors and verbalizations using the SCICA Observation and Self-Report forms. For 6- to 12-year-olds, this includes 235 items, each scored from 0 to 3, with 0 indicating “no occurrence” and 3 indicating “severe intensity or > 3 minutes” (during the interview). Sample items are “Defiant, talks back, or sarcastic” (Observed and Externalizing scales) and “Reports feeling worthless or inferior” (Self-Report and Internalizing scales). The SCICA yields broadband Internalizing and Externalizing scores as well as several narrow band subscale scores. Separate total Self-Report and Observed problem scores are also derived based separately on the child’s reported difficulties and clinician observations during the interview. The SCICA has good psychometric properties, with test-retest reliability (12 days) ranging from $r = .69$ to $r = .89$ for broadband scores and interrater reliability ranging from $r = .52$ to $r = .72$ (McConaughy & Achenbach, 1994). In this study, a subset of videotapes ($n = 16$) was coded for reliability by another child psychologist. Correlations on broadband scales (Internalizing, Externalizing, Self-Report, Observed) were at or above $r = .65$.

*System for Coding Affect Regulation in the Family.* The System for Coding Affect Regulation in the Family (SCARF; Lindahl, Clements, & Markman, 1993) is an observational paradigm and rating system designed to assess child behavior and parent-child interaction during a challenging or frustrating experience. Originally developed for children approximately 5 years of age and their mothers, the SCARF was adapted for use with 6-year-olds. This behavioral observation strategy allows close scrutiny of the quality of the child’s emotion regulation, both individually and during an interaction with the mother, and also allows examination of the manner in which the mother helps the child to regulate his or her emotional responses.

This study included a series of tasks in which the child was alone or interacting with the experimenter, as well as two parent-child interaction tasks. These included a cognitive task involving circling specified letters out of a random series, a positive affect task of playing a game with the experimenter, an anxiety task involving a brief interview regarding parent-child separations, and a frustration task consisting of an impossible timed game. Each 5-minute task was separated from the previous one by a 2-minute baseline period, during which the child was asked to sit quietly. In the first parent-child interaction task, the pair was instructed to complete an Etch-a-Sketch picture jointly, with the mother to give only verbal assistance. Last, the mother and child were instructed to discuss a problematic issue in the parent-child relationship.

Child and mother were videotaped during individual and joint tasks, and videotapes were later reviewed and rated by coders blind to family history and child asthma status. Coders rated a number of individual dimensions of child and parent behavior, which were then used to create summary scores of the child’s regulation of his or her own negative emotion and the mother’s regulation of the child’s negative emotion. Child emotion regulation and behaviors were rated on 5-point Likert scales of Positive Affect, Negative Affect, Withdrawal, Engagement, and overall Negative Affect Regulation. These
scales are combined to yield summary scores of the quality of the child's affect, Child Negativity, and the child's regulation of his or her own negative affect, Emotion Regulation. Maternal behaviors in relation to the child are rated on 5-point Likert scales including Emotional Support, Emotional Invalidation, Physical Nurturance, Affective Attunement, Control, and overall Negative Affect Regulation of Child. Summary scores derived from these scales reflect the quality of the mother's affect in the interaction with the child, Maternal Negativity, and the mother's regulation of the child's negative affect, Maternal Emotion Regulation.

Reliability for the SCARF scales has been found to be satisfactory. Lindahl and colleagues (Lindahl et al., 1993) reported average interrater Pearson correlation coefficients of $r = .82$. For this study, coders were first trained to reliability on the SCARF by the PI. Ratings were then completed by one coder, and a second coder rated a subsample of videotapes for reliability ($n = 23$). Intraclass correlations, computed for the summary scales to assess overall agreement between coders, ranged from .68 to .84. Internal consistency estimates for the summary scales ranged from .75 to .88.

**Results**

We first report the relationships among the emotion regulation and adjustment scores for the entire sample. Then, we will compare the scores for the children with asthma with those of the healthy group. We will report the association between asthma severity and the emotion regulation and adjustment scores. Finally, we will present data demonstrating that difficulties in emotion regulation are related to higher levels of asthma symptoms.

### Interrelationships Between Child Emotion Regulation and Adjustment

The capacity to regulate emotion effectively is conceptualized as a skill that emerges over the course of a child's development. As such, it is distinct from a global assessment of child adjustment but should be positively associated with child adjustment. Table I presents the relationships among these variables for the entire sample of children. Correlations between the parent report (CBCL), clinician interview (SCICA), and observational tasks of emotion regulation are presented.

These data indicate little association between the CBCL broadband scores and the SCICA Observed or Self-Report scores. Mothers' reports of their children's externalizing behavior, completed before the laboratory visit, were significantly correlated with the child's ineffective emotion regulation during the dyadic interaction, $r = -.28, p < .01$, and with ratings of maternal negativity made during the same interactions, $r = -.24, p < .05$. In contrast, the Observed scores from the SCICA were strongly related to ratings of the child's emotion regulation when separated from mother, $r = -.53, p < .0001$, and during interaction with the mother, $r = -.36, p < .001$. They were also significantly related to the child's negativity when apart from the mother, $r = -.28, p < .01$. The SCICA Self-Report

<table>
<thead>
<tr>
<th>Table I. Correlations Among Emotion Regulation and Adjustment Variables</th>
<th>CBCL External</th>
<th>SCICA Observed</th>
<th>SCICA Self-Report</th>
<th>Child Emot Reg-Apart</th>
<th>Child Emot Reg-Dyadic</th>
<th>Child Neg Apart</th>
<th>Child Neg Dyadic</th>
<th>Maternal Emot Reg</th>
<th>Maternal Negativity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBCL Internal</td>
<td>.44****</td>
<td>-.04</td>
<td>-.08</td>
<td>.18+</td>
<td>-.07</td>
<td>.16</td>
<td>.03</td>
<td>.01</td>
<td>-.10</td>
</tr>
<tr>
<td>CBCL External</td>
<td>.18+</td>
<td>.08</td>
<td>-.11</td>
<td>-.28**</td>
<td>-.12</td>
<td>-.15</td>
<td>-.19+</td>
<td>-.24*</td>
<td></td>
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<tr>
<td>SCICA Observed</td>
<td>.01</td>
<td>-.53****</td>
<td>-.36***</td>
<td>-.28**</td>
<td>-.19+</td>
<td>-.16</td>
<td>-.18+</td>
<td></td>
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<tr>
<td>SCICA Self-Report</td>
<td>.08</td>
<td>-.04</td>
<td>-.11</td>
<td>-.07</td>
<td>.12</td>
<td>-.08</td>
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<tr>
<td>Child Emot Reg-Apart</td>
<td>.34***</td>
<td>.58****</td>
<td>.25**</td>
<td>.01</td>
<td>-.03</td>
<td></td>
<td></td>
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<tr>
<td>Child Emot Reg-Dyadic</td>
<td>.30**</td>
<td>.82****</td>
<td>.22*</td>
<td>.19+</td>
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<td></td>
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<tr>
<td>Child Neg Apart</td>
<td>.40****</td>
<td>.01</td>
<td>.07</td>
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<tr>
<td>Child Neg Dyadic</td>
<td>.16</td>
<td>.25*</td>
<td></td>
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<tr>
<td>Maternal Emot Reg</td>
<td>.73****</td>
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</table>

*p < .10.
*p < .05.
*p < .01.
*p < .001.
*p < .0001.
scores were unrelated to behavioral observations of the child’s emotion regulation, either with mother or apart from her. Ratings of emotion regulation and negativity were most highly correlated when measured in the same context, \( r = .58, p < .0001 \). Emotion regulation measures from the different contexts, with and without mother, were also significantly correlated at \( r = .34, p < .001 \).

**Adjustment and Emotion Regulation in Children With and Without Asthma**

We expected that the children with asthma would have more behavioral and emotional problems than the healthy controls, but that these findings would vary as a function of informant. We used ANOVAs to examine the relationships between asthma status and the measures of child adjustment, including the CBCL (parent report), the SCICA (clinician interview), and the SCARF (behavioral observation of emotion regulation). Emphasis was given to the broadband scales of the CBCL and the SCICA.

We conducted preliminary analyses for all variables with gender as a factor. No significant findings were related to gender, so it was not included in further analyses. Since some prior research has emphasized the role of allergy in child behavior problems (Block et al., 1964, Bussing et al., 1995) we initially included allergic status as an independent variable in all analyses. None of the variables of primary interest was significantly related to allergic status, and it was therefore not controlled in subsequent analyses.

Mothers of children with asthma reported higher Total Behavior Problem scores (Asthma \( M = 55.17, SD = 0.90 \); No Asthma \( M = 50.36, SD = 1.72 \)), \( F(1, 101) = 6.16, p < .05 \), and higher scores on the Internalizing scale (Asthma \( M = 53.99, SD = 0.86 \); No Asthma \( M = 49.14, SD = 1.66 \)), \( F(1, 101) = 6.75, p < .05 \), than did mothers of children who did not have asthma. No significant differences in maternal report of Externalizing behaviors were found between the two groups (Asthma \( M = 54.56, SD = 1.05 \); No Asthma \( M = 51.55, SD = 2.01 \)), \( F(1, 101) = 1.76, ns \).

The assessment for effects of asthma on child adjustment, measured by the SCICA, used a similar analytic strategy. The ANOVAs indicated no significant differences in child adjustment between the groups of children with and without asthma on the four broadband scales of Observed Problems, Self-Report, Internalizing, and Externalizing, all \( F(1, 101) < 0.58, ns \).

We used multivariate ANOVAs (MANOVAs), with asthma status as a between-groups factor, to assess for group differences due to asthma status on multiple measures of child emotion regulation. For the first MANOVA, two measures of child Emotion Regulation, one assessed when the child was apart from the mother (Emotion Regulation-Apart) and the other when the two were together (Emotion Regulation-Dyadic), were grouped as dependent variables. Results indicated no significant differences in emotion regulation between the children with asthma and those without, \( F(1, 100) = 0.22, ns \). Again using asthma status as the independent variable, we conducted a second MANOVA with Child Negativity measured apart from the mother (Negativity-Apart) and together with her (Negativity-Dyadic). Results showed no differences between the children with asthma and those without, \( F(1, 100) = 0.32, ns \). A third MANOVA was used to assess whether Maternal Emotion Regulation and Maternal Negativity differed for children with and without asthma. There were no significant differences in the maternal behavior, \( F(1, 100) = 0.72, ns \).

**Adjustment in Relation to Asthma Severity**

Among the children with asthma, behavioral and emotional problems were expected to increase with increasing asthma severity. We used Pearson correlation coefficients to examine the relationship between asthma severity and child behavioral adjustment. Among the children with asthma, there was no relationship between severity of illness and any of the CBCL broadband scales, all \( r < .07, ns \).

We used similar analyses to examine relationships between asthma severity and child adjustment as assessed by the clinical interview (SCICA) ratings. In contrast with the parent report data, the clinical interviews with the children revealed significant relationships between asthma severity and problematic behavior. Increasing levels of asthma severity were related to higher scores on the broadband Observed scale, \( r = .23, p < .05 \). The relationship between the Self-Report scale and asthma severity approached significance, \( r = -.22, p = .06 \), with greater severity related to fewer reported problems. No significant relationships were found between asthma severity and either the Internalizing
components of the severity scale.

Emotion Regulation and Asthma Severity

Difficulties with emotional regulation were also expected to increase with greater illness severity among the children with asthma. Pearson correlation coefficients were used to assess relationships between asthma severity and the two ratings of emotion regulation. Greater asthma severity was related to increased difficulty regulating emotion in a situation wherein the mother was absent, Emotion Regulation-Apart, \( r = -0.23, p < 0.05 \). The relationship between asthma severity and poorer emotion regulation in the presence of the mother, Emotion Regulation-Dyadic, approached statistical significance, \( r = -0.21, p = 0.06 \). The two Emotion Regulation scores were combined into a composite score due to their moderate correlation \( (r = 0.34) \). This composite Emotion Regulation score was significantly correlated with asthma severity, \( r = -0.27, p < 0.02 \).

Child Negativity-Apart was not significantly associated with asthma severity, \( r = -0.07, ns \). However, Child Negativity-Dyadic was significantly correlated with asthma severity, \( r = -0.24, \) indicating that during interactions with mothers, the children with more severe asthma expressed greater negative affect. The two child negativity measures were also moderately correlated, \( r = 0.40, \) but when combined into a summary score they were not significantly correlated with asthma severity, \( r = -0.18, ns \). Neither Maternal Emotion Regulation of the child nor Maternal Negativity was significantly associated with asthma severity, \( r = 0.00 \) and \( r = 0.12, \) respectively.

Emotion Regulation and Asthma Symptoms

The literature regarding the relationship between asthma severity and psychological adjustment has been inconclusive. We have suggested that such a relationship appears when investigators use severity measures encompassing symptoms and symptom control rather than measures of pulmonary functions or medication requirements. In this study, we examined the relationship between the emotion regulation and adjustment variables and the two components of the severity scale.

We explored relationships between symptom and medication components of the severity scale and adjustment and emotion regulation measures. For simplicity, the composite scores for child Emotion Regulation and Negativity were employed. The Symptom scale was significantly correlated with the composite Emotion Regulation score, \( r = -0.31, p < 0.01 \), and with the SCICA Self-Report score, \( r = -0.32, p < 0.01 \), but not with the SCICA Observed scale, \( r = 0.10, ns \). The correlation between the Medication scale and Emotion Regulation only approached significance, \( r = -0.20, p < 0.10 \); it was unrelated to the SCICA Self-Report scale, \( r = -0.09, ns \); and it was significantly correlated with the SCICA Observed scale, \( r = -0.25, p < 0.05 \). Like the Total Severity score, the two component scores were unrelated to the CBCL broadband scales, and they were also unrelated to Child Negativity and Maternal Emotion Regulation and Negativity.

To further explore the relationship between the psychological variables and the children’s asthma symptom levels, a hierarchical multiple regression was computed with the Symptom scale as the response variable. We wished to test the contribution of the three informants regarding the child’s psychological functioning, that is, the parent’s report (CBCL Total Behavior Problem score), the child’s own report (SCICA Self-Report), and the behavioral ratings of child emotion regulation. Because the Emotion Regulation and the SCICA Observed scores were highly correlated, we included the emotion regulation score because of greater theoretical interest. The Medication scale was entered prior to the psychological measures, to first account for that portion of symptoms due to asthma severity. As shown in Table II, after medication level was accounted for, emotion regulation accounted for almost 5% of the variance, with poorer emotion regulation related to higher symptom scores. The CBCL score did not add a significant increment in prediction. However, the SCICA Self-Report variable contributed almost another 7%, with lower self-report of problems related to more asthma symptoms. Thus, after we accounted for asthma severity

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**Table II. Summary of Hierarchical Regression Analysis for Variables Predicting Asthma Symptoms**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cumulative ( R^2 )</th>
<th>Significance level</th>
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</thead>
<tbody>
<tr>
<td>Medication level</td>
<td>0.228</td>
<td>.0000</td>
</tr>
<tr>
<td>Emotion regulation</td>
<td>0.278</td>
<td>.025</td>
</tr>
<tr>
<td>CBCL Total Score</td>
<td>0.289</td>
<td>.289</td>
</tr>
<tr>
<td>SCICA Self-Report</td>
<td>0.358</td>
<td>.007</td>
</tr>
</tbody>
</table>
measured by required medications, less effective emotion regulation and a lower level of self-reported psychological symptoms were associated with higher levels of asthma symptoms.

Discussion

The emotional and behavioral adjustment of children with asthma has received a great deal of attention from investigators, yet clear conclusions have remained elusive. Our study focused on children’s ability to regulate their emotions, a dimension of the behavior of children with asthma not previously described. The findings presented here help to clarify some of the pertinent issues and provide future directions for research.

We assessed the behavioral and emotional functioning of a group of children with asthma and a healthy comparison group utilizing a multimethod approach, including a commonly used parent report measure (CBCL), a standardized child interview measure (SCICA), and behavioral observation of the children’s emotion regulation (SCARF). Data showing the relationship among these measures indicated that the parent report and the child interview broadband scales were unrelated. There were some associations between mothers’ reports of behavior and the behavioral ratings of emotion regulation. The CBCL Externalizing scale was associated with observations of poor child emotion regulation in the laboratory as well as with observations of maternal negativity during interactions with the child.

Intercorrelations provided evidence for consistency in children’s emotion regulation across contexts. The quality of mothers’ attempts to regulate their children’s emotions was associated with the children’s emotion regulation when the two were interacting. The overall amount of negativity each of them displayed in the dyadic context was also correlated. However, maternal emotion regulation and negativity were unrelated to the child’s emotion regulation when apart from the mother. Despite some context specificity of the child emotion regulation measures, the intercorrelations and the fact that patterns of associations with other variables were similar regardless of context suggest that a trait-like characteristic of the children was being measured.

There was a strong relationship between poor emotion regulation and higher scores on the Observed scale of the SCICA. These two assessments were completed on separate days during interactions with different adults, with distinct scoring methods and different raters. High scores on the SCICA Observed scale result when the clinician notes behavior that interferes with the smooth conduct of the clinical interview, much of it in the interpersonal realm, involving negative affect and disrupting the conduct of the task. Ratings of poor emotion regulation indicate negative affect that is disruptive to task completion or to interpersonal interactions. Thus, the similarity in the behavioral bases of assessment may account for the strong correlations between the emotion regulation and clinical interview measures. The fact that the CBCL Externalizing score was associated with poor emotion regulation provides further evidence that the interview and emotion regulation measures were assessing disruptive behavior. These difficulties may indicate general behavioral dysfunction, or they may represent subtle problems in emotional modulation that do not reach threshold for disorder but result in interpersonal difficulties, such as have been observed by prior researchers (Mrazek et al., 1985).

When the children with asthma were compared with the healthy children, there were no differences between them on either the child interview measures or the emotion regulation measures. In contrast, this study provides a clear replication of previous findings that mothers report higher levels of overall and internalizing problems for their children with asthma than do mothers of healthy controls (Hamlett et al., 1992; Kashani et al., 1988; MacLean et al., 1992). This pattern of results parallels those of Kashani et al., who found that the parent report measure (CBCL) showed increased problems among children with asthma, but the child interview diagnostic measure did not reveal such increases.

Within the group of children with asthma, severity of asthma showed a mixed relationship with the psychological measures. For the parent report of problems, there was no relationship between asthma severity and behavior problem scores. In contrast, significant relationships were demonstrated between asthma severity and the emotion regulation and child interview measures. Difficulties with emotion regulation were found to increase with greater asthma severity. The child interview also showed increasing overall observed child behavior problems, including more interpersonal difficulties, with increasing asthma severity. These findings are particularly striking, given that inter-
viewers and raters were blind to the child's group status (asthma or control), as well as the clinical severity of asthma. These results are consistent with the findings of Mrazek et al. (1985), who described negative affect and emotional dysregulation among preschoolers with severe asthma.

We further explored psychosocial associations with asthma severity by examining the correlates of the two components of the severity scale. Medication level was found to have few significant relationships with psychosocial variables. In contrast, more asthma symptoms were associated with low SCICA Self-Report scores and poor emotion regulation. The relationship between few reported psychological difficulties and a higher symptom level may be accounted for by a repressive cognitive style, which has been reported among asthmatics (Weinberger, 1991), or frank denial. The association between emotion dysregulation and more frequent, poorly controlled asthma symptoms is consistent with previous research showing a relationship between psychological difficulties and greater asthma severity, when the latter is measured in terms of functional status such as symptoms and health care utilization (Stein & Jessop, 1984). There is increasing evidence suggesting that poor symptom control is often linked to poor adherence with medication (Milgrom et al., 1994) and poor asthma management in general (Klinnert, McQuaid, & Gavin, 1997). Poor adherence and asthma management for childhood asthma has been related to both child (Christiannse, Lavigne, & Lerner, 1989) and family dysfunction (Wamboldt, Wamboldt, Gavin, Roesler, & Brugman, 1995). The role of overall family dysfunction in contributing to poor child emotional regulation, poor adherence to medication regimens, and greater asthma severity merits further investigation.

Longitudinal data are necessary to assess causal relations between asthma symptoms, emotion regulation, and behavioral difficulties. One might view the stresses associated with asthma as interfering with developmental processes in such a way that emotions become dysregulated and behavioral symptoms occur. Another intriguing possibility is that observable emotional dysregulation may be related to aspects of physiologic dysregulation involved in asthma (Lehrer, Isenberg, & Hochron, 1993). This physiological dysregulation could be an underlying mechanism for both disease fluctuation and difficulties in emotion regulation.

Findings from this study, utilizing multimethod behavioral assessment, provide a model for explaining previously contradictory study results. As a group, children with asthma probably have minimal increases in psychological problems compared to children without asthma. The exception is that parents of children with asthma report more internalizing disorders in their offspring, generally along the anxiety spectrum. Apparently anxiety is present at a low level for many children with asthma and is unrelated to disease characteristics. Parents may have a lower threshold than clinicians for detecting psychological distress among these children, a possibility that explains why clinicians have infrequently noted increased anxiety among children with asthma.

Within the population of children with asthma, a second group has generally gone unrecognized: children with poor regulation of negative emotions and higher levels of asthma symptoms. Emotion dysregulation, possibly more apparent to outside observers than to parents, is characterized by difficulty managing negative affect and interpersonal interactions marked by negativity and conflict. Such behavior patterns, often too subtle to reach diagnostic thresholds, appear to be more common among children with severe asthma, particularly those with frequent, uncontrolled symptoms who find their way to emergency rooms or require hospitalization. Although these children may deny psychological problems, their difficulties may be observed in their ineffective responses to interpersonal challenges. At high levels poor emotion regulation will be manifested as disruptive negative affect, low frustration tolerance resulting in inability to complete tasks, or conflict with caregivers or staff. Children with unmanaged and disruptive negative affect may appear to have more negative relationships with their parents. Although the directionality of such relationship difficulties is unknown, conflicted parent-child relationships have been reported in the literature, with greater conflict associated with increased asthma severity (Hermanns et al., 1989) and even with asthma mortality (Strunk, Mrazek, Wolfson Fuhrmann, & LaBrecque, 1985).

The contrasting patterns of functioning found in this study for the same children, with parent reports providing one view and reports by external observers providing another, illustrate the importance of utilizing different measurement approaches for understanding the problems faced by children with asthma. No one measure provides the true picture of children's psychological adjustment, but rather different measures and different infor-
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References


McNicol, K. N., Williams, H. E., Allan, J., & McAndrew, I. mants provide information about separate facets of children's functioning. In fact, the discrepancies themselves likely reflect different aspects of the children's and their families' functioning. As noted by La Greca and Lamanek (1996), future research is needed to elucidate the factors contributing to such discrepancies. For children with asthma, more specific information regarding difficulties in parent-child interactions, or parental perception of illness burden in asthma, may help to delineate the discrepancies noted between parents and others found consistently in the literature.


