Effects of a Behavioral Treatment Program on Children with Asthma

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ABSTRACT

Twenty children with severe asthma using continual oral beta₂ agonists were randomized equally into either a behavioral intervention group or a control group. The behavioral intervention consisted of: symptom discrimination of asthma signals, self-management techniques of breathlessness, and contingency management of asthma-related behavior. The purpose of the study was to evaluate the effects of the behavioral treatment when superimposed on a regular medical treatment. The design consisted of a four-week baseline period, a four-week intervention period, and a four-week follow-up period. Results showed that the group receiving the behavioral intervention significantly reduced their use of beta₂ agonist spray doses and days of school absenteeism without increasing the number of asthma symptoms compared with the control group. It was concluded that children with severe asthma may benefit substantially from a behavioral program in addition to their regular medical treatment.

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INTRODUCTION

Due to the nature of chronicity of asthma, asthmatic symptoms are observed to be susceptible to environmental control. Asthma attacks are frequently observed to be preceded by emotional arousal such as anger, sadness, excitement, or anxiety. In some cases, asthma attacks appear to be driven by their consequences as well. Behavioral treatments of asthma have concentrated on four problem areas: correct symptom discrimination, conditioned fear related to attack behaviors, use of contingency management to increase self-control of symptoms, and drug-compliance techniques.

Symptom discrimination refers to the child's ability to discriminate early asthmatic symptoms and to react appropriately. The child may show either an underinclusive selectivity by not attending to or perceiving incorrectly the relevant signals or an overexclusive selectivity by reacting to signals other than asthma as if they were asthma. In addition, the conditioned fear response to asthma occurrence also interferes with adequate signal discrimination. Treatment strategies aimed at teaching children to predict and discriminate asthma from other symptoms have been successful in reducing episodes of asthma.

Conditioned fear and anxiety (panic) to asthma may develop due to the traumatic nature of symptoms of breathlessness as well as to treatment situations. These traumatic experiences may result in an increased anxiety level upon detecting asthma signals as well as a higher degree of sensitivity to somatic reactions. Several studies have shown that by reducing conditioned fears and anxiety to the asthma experience, the asthma symptom itself may be reduced.

Contingency management of the asthma symptom refers to controlling the consequences of the asthmatic disease and predicament. Viewed from a learning perspective, asthma behavior may be used as a means to gain advantages (positive reinforcement) or to avoid or escape demanding situations (negative reinforcement). Reasons for this overuse of health care in relation to objective physical symptoms have been reported to be positive attention and care as well as avoidance of demanding situations.

Treatment strategies for overusers have focused upon a variety of "time-out" procedures where children were admitted to the hospital upon evidence of asthma symptoms, but not allowed to leave the hospital room nor to have access to comic books, television, and/or social visits. Several studies have shown these time-out procedures to be effective in reducing this "overuser" behavior. Creer and Hochstadt et al. showed time-out to be useful for reducing mean length of stay in the hospital for children with asthma.

Problems with compliance to asthma medication have been dealt with behaviorally in several studies, by training children in the correct use of inhalation therapy equipment upon appropriate signals. A behavioral-medical strategy for treatment of children with chronic asthma could be to combine these four components of symptom discrimination training, self-control techniques, contingency management of asthma-related behavior, and compliance training into a treatment package. Similar behavioral therapy packages have been successful in the treatment of other chronic illnesses in children, such as epilepsy.

The purpose of the present study was to evaluate the effects of a behavior therapy treatment package when superimposed on the traditional caretaking procedures.

METHODS

Subjects

Twenty children with severe asthma using continually betaagonist therapy participated in the study. Consent was obtained from the parents of all the children, and the study was approved by the hospital ethical committee. A summary of the medical data for each child is given in Table 1.

Procedure

Following a four-week baseline period, the 20 children were randomized into two groups,
Behavioral Treatment Program for Asthmatic Children

Table 1. A Description of the Children

<table>
<thead>
<tr>
<th></th>
<th>TREATMENT</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys/girls</td>
<td>7/2</td>
<td>4/6</td>
</tr>
<tr>
<td>Age (years)</td>
<td>12.0</td>
<td>12.4</td>
</tr>
<tr>
<td>Atopic</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Other continual medication</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Average spray doses/day</td>
<td>8.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Average school absenteeism per month</td>
<td>4.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Average days experiencing asthma symptoms</td>
<td>12.1</td>
<td>8.9</td>
</tr>
</tbody>
</table>

The children were divided into a behavior therapy group and a nonintervention control group, each lasting four weeks. All children were subsequently followed up a final four-week period.

Behavior Analysis (BA)

A behavioral analysis was made for each child during the baseline period. This analysis contained interview questions addressed to the children, parents, and respective teachers at school, along with daily recording of asthma-relevant information. The questionnaires covered the following areas: antecedent stimuli, situation of the asthma attack, a topographical description of the attack, and the consequences of the attacks for the child, parents, and teachers. Infections and emotional states such as fear of breathlessness and suffocation were also investigated.

In addition, questions of overprotection, social isolation, cooperation between home and school, and the school situation were rated. Compliance to continual "as-needed" medication as well as adherence to restrictions in lifestyle were also recorded. Finally, health care and hospital consumption were rated in terms of underusers, adequate users, or overusers.

Daily charts were kept by both children and parents, which included the following variables: exhalation frequency, AM and PM; peak expiratory flow rate (PEFR), AM and

PM; rating of activities of daily life (ADL) influenced by asthma; subjective experience of asthma symptoms; global rating of general status; days home from school, drug consumption "as-needed", and continual, and other illnesses.

Behavior Therapy (BT)

The behavior therapy treatment was tailored for each child according to his/her BA. The four 1-hour treatment sessions were held in the child's home and or school environment. Principles for the BT treatment followed the problem area as revealed in the BA and were as follows: discrimination training of asthma signals, self-management techniques of breathlessness, counterconditioning of any learned fear response, contingency management of asthma-related behavior, and compliance training.

Discrimination training of correct asthma signals implied instructing the child to blow in the PEFR apparatus and to record the value upon experiencing breathlessness during the week. Those values together with other daily chart values helped to determine the child's ability to discriminate correct signals. Using PEFR measurements, the child obtained biofeedback information of actual airflow obstruction. During the session, this technique was practiced by eliciting slight asthma symptoms (usually by performing exercises) and requiring the child to determine if the symptoms were actually asthma and subsequently checking the PEFR.

Self-control techniques in the form of progressive relaxation, abdominal breathing exercises, and distraction techniques were taught to each child initially in a reclining position and subsequently in positions more similar to everyday "asthma situations." The children learned to apply this coping technique to actual asthma situations first in role play together with the therapist, and subsequently in vivo for homework assignments between sessions.

Systematic desensitization of the phobic stimuli was made by exposing the child in a hierarchical fashion to the asthma-relevant
stimuli which elicited a fear reaction. Exposure of fantasy and in vivo was made while the child simultaneously applied self-management techniques including relaxation and abdominal breathing. Examples of the fear stimuli ranged from that which was directly associated with asthma such as plastic imitations or pictures of the allergenic material to factors not directly associated with asthma such as social situations.

The contingency management program was for those children who were judged to be "overusers" of hospital facilities clearly for reasons of gaining advantages, attention, and/or avoiding school. These children, who often frequented the emergency room without showing significant objective airflow obstruction, were allowed to be admitted to the pediatrics unit as usual. However, special time-out procedures were issued to the staff upon the child's arrival. These children were not allowed to leave their rooms nor to have access to television, comic books, play therapy, or social visits other than parents. The school was immediately contacted and a teacher agreed to come to the hospital the first morning with all of the child's homework. In addition, if a child had a high rate of absenteeism and there was a clear discrepancy between objective and subjective asthma measures, for example, when a child blew a normal PEFR in the morning but reported asthma symptoms and consequently stayed home from school, intervention measures were applied. The parents, as well as the child, were taught to check objective measures of asthma and to send the child to school if measures showed normal airflow values.

Social skills training was provided for those children in the BT group who often, because of social isolation, lacked social skills and experienced anxiety in social situations. Training consisted of role playing of current social situations and application of self-control techniques plus assertiveness training.

Training in compliance entailed teaching the children in the BT group an appropriate compliance technique for using the spray medication. Using the discrimination skills and self-control techniques, the child learned a step-by-step action program to perform upon perception of breathlessness.

The children were taught to rely on their self-control technique initially and to employ the spray medication as a secondary measure. However, many children continued to spray prophylactically prior to high-risk situations, for example, before gymnastics classes. The purpose of compliance training was to counteract psychological dependence on the spray medication which entailed an exaggerated consumption, usage upon wrong signals, and functions as an anxiety reducing tool.

Children were also trained in systematic desensitization to reduce anxiety which develops relevant to the spray medication. Children in the BT group were taught to imagine, for example, that they had just been left on an island with a friend to camp for the weekend. The child suddenly discovers the spray medication has been forgotten. In this way the child learns to reduce his or her panic reaction and dependence on the spray and increase trust in his/her own capability to cope with the asthma situation. The goal was not necessarily to use less spray, but to use it appropriately in response to the correct asthma signals and in an appropriate fashion.

Control Group

With the exception of the BA and recording of the asthma charts, the control group continued as usual in the regular caretaking format for children with asthma at a pediatrics unit.

RESULTS

Results showed that the group receiving BT had significantly reduced gain scores of two measures of asthma symptoms: number of "as-needed" spray doses per day (t=2.39, p<0.05) and number of days of school absenteeism (t=2.4, p<0.05) compared with the control group. Number of days in which asthma was subjectively experienced was also reduced by 50% for the group receiving BT. One child was dropped from the treatment
group due to lack of reliable dependent measures. Figure 1 shows the percent change from baseline to follow-up for number of “as-needed” spray doses per day, number of days absent from school, and the subjective experience of asthma for the BT and control groups.

In addition, for the entire group of 19 children, no significant difference was found for those variables directly measuring lung function (PEFR and exhalation frequency) either before or after. Neither was any significant correlation found between the objectively measured air flow obstruction (PEFR, exhalation rate) taken AM and PM, and number of beta2 agonist spray doses. There was no correlation between the objective measures of asthma used in this study and school absenteeism. There was, however, a positive correlation between subjectively experienced asthma and experienced panic in connection with asthma as measured by averaging 5-point ratings of observed panic behavior by three independent observers and school absenteeism (rs = 0.63; p < .05). There was also a positive correlation between experience of panic in asthma situations and number of spray doses per day (rs = 0.49; p < 0.05).

DISCUSSION

The results of the study showed that relatively short-term behavior therapy intervention can significantly reduce use of beta2 agonist spray doses and days of school absenteeism without increasing the number of asthma symptoms. Another objective of this study was to investigate which children would benefit most by this type of intervention. The correlation studies can be concluded as follows: the degree of handicap which the child with asthma develops is not necessarily related to the objective severity of the asthma, but rather on a number of psychosocial factors: learning history of asthma episodes, aversive conditioning to asthma stimuli, consequences in the environment, child’s own coping strategies, and parents capabilities of coping with asthma situations.

Within the group who received BT, there were children who improved dramatically on all measures. These children had several common characteristics as shown in the asthma charts and the BA. First, there was shown to be a clear discrepancy between subjective and objective asthma measures. These children

![Figure 1](image-url)
were judged to be extremely socially isolated and with a high rate of absenteeism from school. Both of these factors appeared to contribute to significant deficits in social and academic skills. These children were also judged to be “overusers” of the hospital facilities and of the “as-needed” spray medication. A child with asthma showing evidence of these problems may therefore benefit from a behavior therapy treatment program.

As in all treatment packages, it is difficult to judge the effect of any single component. However, from earlier studies, together with the present one, it could be hypothesized that the application of relaxation and breathing exercises has several beneficial attributes. First, it may reduce anxiety and feelings of panic connected with the asthma symptoms. Other studies have suggested that relaxation skills actually increase lung function and subsequently reduce asthma symptoms. The present study has shown no such evidence. However, it appears that relaxation may aid the child in discrimination of asthma signals from other symptoms and subsequently taking appropriate action. Relaxation also appears to help the child to use his/her spray medication more appropriately upon interpreting correct signals and with the correct technique. It is important to emphasize that the effects of relaxation and breathing exercises when used as a self-control technique may depend on teaching the child these skills in the child’s natural environment and with actual asthma stimuli. All of the children in the group had received physiotherapy training, including relaxation and breathing skills, in the hospital environment. Despite this training, significant improvements were made when applying these techniques in the natural environment. It may be worthwhile for the physiotherapist to help the child with such training when and where the symptoms naturally occur rather than in the medical clinic. In sum, children with chronic asthma may be able to significantly reduce reliance on spray medication and minimize school absenteeism after relatively short-term behavior therapy intervention applied in the home environment.

REFERENCES