Medico-Psychological Interventions in Male Asthmatic Children: An Evaluation of Physiological Change

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The purpose of this study was systematically to evaluate the effectiveness of several modes of psychological intervention used with male asthmatic children being treated in the Allergy Outpatient Clinic. Therapeutic effectiveness was measured by large airway changes in respiratory function, and the number of recurrent asthmatic attacks. The psychotherapeutic modes used were Relaxation Training, Assertive Training, and combined Relaxation plus Assertive Training. All patients were administered medication by the responsible physician. The group psychotherapy experiences were controlled by using patients who received medication alone and by patients who received medication and met in a leaderless group. The effectiveness of the therapeutic interventions was determined by comparisons between pretreatment measures and measurements taken during and after the eight-week treatment program. Both Relaxation Training by itself and combined Relaxation plus Assertive Training increased respiratory functioning and reduced the number of attacks. Assertive Training alone failed to improve respiratory function and had a tendency to increase the frequency of asthmatic attacks. It was concluded that the most effective management in male asthmatic children was achieved by the combination of medical and psychological treatments.

INTRODUCTION

Bronchial asthma is characterized by episodes of breathlessness caused by constriction of the smooth muscles of the bronchiole tubes. Air exchange is thus impeded, and can be completely obstructed. Factors such as atopy, infection and physical exertion are associated with asthmatic attacks. Clinical observations suggest that psychosomatic factors can exacerbate and precipitate asthmatic symptoms.

Several studies have assessed the psychological concommitants of asthma. Emotional arousal has been associated with the onset of asthma (1). Specific emotions, such as sadness, anger, fear, anxiety, or sexual excitement have been shown to cause sufficient stress to precipitate an attack. (2). Asthmatics also have been reported to be suggestible (3), and experience difficulty in breathing when criticized (4).

In view of the findings that tension can precipitate asthmatic symptomatology, a study was designed to assess the tension

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reducing capacity of three forms of psychological intervention on asthmatic children: Relaxation Training, Assertive Training, and Combined Relaxation plus Assertive Training.

Relaxation Training (RT) was used because previous research had found that RT effectively increased respiratory flow rates (5). Assertive Training (AT) was used as a treatment because studies have found that asthmatics are deficient in assertive skills, and are impaired in their ability to express anger or aggression (6–9). RT plus AT was used to determine if the combined treatment would be more effective than RT or AT used as separate interventions.

METHODS

The patients in this study consisted of 43 male children who were being treated in the Allergy Outpatient Clinic at Cook County Hospital for bronchial asthma. Their mean age was 12.4 years with a range of 10–17 years. The study took place between February and August.

Measures of respiratory functioning and asthmatic attack frequencies were obtained prior to the experiment, at weekly intervals during the experiment, and at a post-session four weeks after the experiment was terminated. The two measures were obtained after each group session prior to medical examination and drug treatment. A nurse unaware of the specific group to which the child was assigned took the measurements. Pulmonary function scores were recorded from a Monaghan M403 Pulmonary Function Analyzer (Forced Expiratory Volume /First Second: FEV_1). These scores reflect large airway obstruction and change. The frequency of attacks occuring in the previous week was obtained by a report from the parents. These two measures provide a method by which the physician can guage the effectiveness of the prescribed medical treatment.

The patients were randomly assigned to one of three treatment groups, or to one of two control groups. The three psychological intervention and two control procedures are outlined in Table 1. The treatments were Relaxation Training, Assertive Training, and Combined Relaxation plus Assertive Training and were conducted as described below.

TABLE 1. Design of the Study

Group	N	Treatment
Relaxation Training (RT)	9	RT + Medical Management
Assertive Training (AT)	9	AT + Medical Management
Relaxation plus Assertive Training (RT + AT)	10	RT + AT + Medical Management
Control (Medical)	7	Medical Management
Control (Group)	8	Medical Management+ Leaderless Peer Group

Relaxation Training

This intervention was a modified form of progressive relaxation ([10], combined with guided imagery. The boys were trained to alternately tense then relax large voluntary muscles, (e.g., face, hand, biceps, triceps, shoulders, and abdominals). After the major body groups were relaxed, guided imagery was used to create visual images of comfort and relaxation (e.g., resting on a bench, watching sailboats, and feeling warm breezes and sunshine). These sessions lasted for forty minutes, once a week, for eight weeks.

Assertive Training

These groups were trained to express socially appropriate feelings and rights. This included role playing and exercises in four major areas: (a) learning to say no to authority figures, (b) learning to practice the expression of positive and negative feelings, (c) learning to initiate and terminate general conversations, and (d) learning to make requests for favors. These sessions lasted forty minutes and were conducted weekly for eight weeks.

Combined Relaxation plus Assertive Training

This treatment consisted of a combination of the two previously described interventions, (Relaxation Training and Assertive Training), incorporated into the same forty minute sessions.

Medical Control Patients

These patients came to the clinic each week to receive medical treatment.

Group Control Patients

These patients also came to the clinic each week to receive medical treatment but, in addition, they sat quietly for forty minutes in a small leaderless group of peers. This group was used to control for the effect produced by the necessity of providing psychological treatments within a small group format.

Medical treatment was independently determined by physicians responsible for patient care. The study patients saw an allergist each week who was unaware of their group placement. He provided physical examinations and medical management. Epinephrin and aminophylline are the major drugs employed to assist in asthma management. Epinephrine is considered to be the most effective bronchodilator acting on the beta-adrenergic receptor sites in bronchial smooth muscles. Aminophylline is used because it relaxes smooth muscles. Both medications increase air flow through the bronchial tubes by relieving bronchial constriction. No drugs were given before the pulmonary measures were taken.

RESULTS

Table 2 displays the Mean FEV_1 prescores ($F=1.74$, $df=5/879$, n.s.). This indicates that all groups began at comparable respiratory levels prior to treatment as was intended by the random assignment procedure. For comparative purposes, the FEV_1 scores of 20 patients with nonrespiratory diagnoses were taken from the Pediatric Hospital (Fig. 1). This sample of nonasthmatics was matched with the study sample for sex, age, and socioeconomic status. Their FEV_1 mean of 1.889 liters/sec provides an FEV_1 norm against which the study population is compared. The mean age per group of the five groups ranged between 12.2 and 12.6 years.

TABLE 2. Mean Pulmonary Function Scores (FEV_1) for All Groups at the Pre-, 4th, 8th, and Post-Wks of Treatment

Group	Pre	4	8	Post
Relaxation Training	1.703	1.682	2.015	2.006
Assertive Training	1.655	1.577	1.569	1.438
Combined RT + AT	1.810	1.769	1.875	1.903
Control (Medical)	1.769	1.779	1.691	1.651
Control (Group)	1.806	1.776	1.780	1.788

A 5 × 4 analysis of variance for repeated measures was used to analyze the FEV_1 data. The results of this analysis of Groups over Time showed a significant difference between Groups ($F=5.83$, $df=4/38$, $P<.01$).

A statistical comparison between the five groups (Newman-Keuls test) showed that AT increased pulmonary function scores when compared to the Medical Controls and AT groups ($P<.05$). The RT + AT group, also showed superior pulmonary function compared to the Medical Controls and the AT groups ($P<.05$). Although the magnitude of increase in FEV_1 was larger for RT, there was no statistical difference between RT and the combined RT + AT groups. Both treatments produced statistically significant improvements in pulmonary function as compared to asthmatics who received medication alone. RT showed a 25% improvement and RT + AT showed a 6% improvement during treatment.

The data for frequency of asthmatic attacks are displayed in Table 3. It is noted that in two instances there is a total absence of asthmatic attacks. This was observed at the eight week of treatment in both the RT and in the combined RT + AT groups. An analysis of variance showed a significant effect over Time ($F=4.71$, $df=3$, $P<.005$), and a significant interaction between Groups and Time ($F=2.14$, $df=12$, $P<.01$).

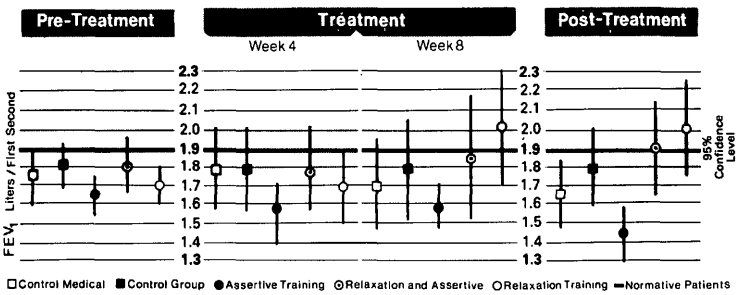

FIG. 1. A comparison of the means of the five groups of asthmatics to a normative group of nonasthmatics at four measurement periods: pre-treatment, fourth and eighth week of treatment, and post-treatment.

TABLE 3. Mean Number of Asthmatic Attacks per patient per wk for all groups at the pre-, 4th, 8th, and Post- wk of Treatment

Group	Pre	4th	8th	Post
Relaxation Training	.43	.11	.00	.44
Assertive Training	.24	.44	.22	1.00
Combined RT + AT	.52	.30	.00	.60
Control (Medical)	.39	.29	.29	2.57
Control (Group)	.26	.38	.75	.13

Comparisons between the groups (Newman-Keuls test) found that Combined RT + AT treatment produced a significant reduction in attacks as compared to all other groups, while RT alone was found to be significantly greater than the Group Controls in attack reduction.

A summary of the findings for the pulmonary data is graphically presented in Fig. 1. The means of the treatment and control groups are displayed at pre-treatment, 4th and 8th weeks of treatment, and four weeks post-treatment. These means are presented in comparison to the mean of a nonasthmatic group plus /minus the 95% interval (gray shading). Plus /minus one standard error is shown for each group by a vertical line drawn through the mean.

Figure 1 shows that all group means of the asthmatics in the study began below the normative patients at pre-treatment testing. The RT group exceeded the normative group by the eight treatment week, and both the RT and the RT + AT groups exceeded the normative nonasthmatics on post-treatment testing.

Changes in asthma medications between the pre- and post-treatment intervals were determined for each patient by an examination of the medical charts. Any alteration in the type of medication used for the treatment of asthmatic symptoms was considered a medication change. Fewer patients in the RT group (3 of 9) had changed medications than in the RT + AT group (6 of 10) and the Control Group (6 of 8); but these differences were not statistically significant (Fisher's test). Furthermore, the number of changed medications in the AT group (6 of 9) and the Medical Control Groups (5 of 6) were not significant (Fisher's test). In view of this, no uniform relationship was found between groups with more

frequent changes in asthma medication (RT + AT, Control) and improvement in pulmonary function (Fig. 1).

DISCUSSION

This study showed that RT and combined RT + AT were effective in improving pulmonary functioning (FEV_1), and reducing asthmatic attacks in male children. Four weeks after treatment was terminated, patients in the two groups were maintaining FEV_1 levels comparable to nonasthmatic children (Table 2). Asthmatic attack frequency however, had returned to pre-treatment levels (Table 3).

It is clear that RT was the most effective psychological intervention used. While no statistical differences were seen between the RT and the RT + AT groups on pulmonary function tests, the RT group showed the largest improvement. Others [1, 2] have noted that emotional arousal may cause asthmatic attacks, thus, it is reasonable that RT would effectively reduce asthmatic symptoms. On the other hand, AT appeared to worsen pulmonary functioning and increase the number of asthmatic attacks. It was reasoned that if asthmatics are deficient in assertive skills [6–9], AT might provide them with such skills, thereby decreasing stressful situations. Apparently, sufficient stress was induced by AT as to interfere with its potential beneficial effects. However, since no direct measures of stress were made in this study, this conclusion must be taken as speculative. In view of the relative worsening of the asthmatic condition associated with AT, the beneficial effects of the combined RT + AT are interesting.

RT + AT were combined to see if the variables being measured would be affected differently than by either of the interventions used individually. In the combined 40 minute treatment group AT was used in the first 20 minutes, and RT in the last 20 minutes. It is reasonable that because of this order RT was able to overcome the stress inducing affects of AT. Thus, the combined group showed effects of pulmonary functioning and attack reduction more similar to the RT group than to the AT group. Future studies in which RT + AT may be combined should take this finding into account, and randomize the sequencing of the RT and the AT interventions within the 40 minute session.

The Group Controls failed to improve on pulmonary functioning, and the number of asthmatic attacks remained fairly constant throughout the period of study. Conversely, the Medical Controls showed slight improvements in attack frequencies, but a notable rebound in the number of asthmatic attacks reported at four weeks after treatment (Table 3). It would not appear that the rebound in asthmatic attacks is attributable to medication(s) since no relationship was found between improved functioning and changes in asthma medication(s). There would be no *apriori* reason to assume that only patients in the RT group took the prescribed medication, while all of the other patients failed to take medication as prescribed. It is possible that the Medical Control group showed a worsening of the asthmatic condition four weeks post-treatment because of the absence of support provided by the allergist during weekly medication visits. It is reasonable, however, that the slight rebound over pre-treatment asthmatic attack levels seen in the RT and the RT + AT groups reflect the removal of an effective intervention.

The extent that psychological intervention may be beneficial to asthmatic children in the absence of proper medication was not assessed in this study. It would seem, however, that the addition of RT to a proper drug treatment program would provide a more efficient approach to treating childhood asthma.

SUMMARY

The findings of this study are consistent with the hypothesis that emotional factors are an important component of the asthmatic syndrome [1, 2]. Indeed, one may postulate that RT and RT + AT were effective in reducing airway obstruction and attack frequency primarily because of tension/anxiety reducing characteristics; and that AT or leaderless groups exacerbated asthmatic symptoms because these processes increased tension/anxiety. It is important to note that no direct measure of tension/anxiety was taken in this study, so the postulated reduction remains to be measured. It is clear that pharmacologic treatment alone may temporarily reduce the incidence of asthmatic attacks, but such treatment alone did not reduce the obstruction of large airway passages when measured over the three month period of the study.

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REFERENCES

1. Mathe A, Knapp PH: Emotional and adrenal reactions to stress in bronchial asthma. Psychosom Med 33:323—340, 1971
2. Knapp PH, Nemetz SJ: Acute bronchial asthma: Concommitant depression and excitement and varied antecedent patterns in 406 attacks. Psychosom Med 22:42–56, 1960
3. Luparello T, Lyons HA, Blecker ER, and McFadden E: Influences of suggestion on airway reactivity in asthmatic subjects. Psychosom Med 30:819–825, 1968
4. Hahn WW: Autonomic responses of asthmatic children. Psychosom Med 28:323, 1966
5. Alexander AB: Systematic relaxation and flow rates in asthmatic children: Relationship to emotional precipitants and anxiety. J Psychosom Res 16:405–410, 1972
6. Mathe A, Knapp P: Emotional and adrenal reactions to stress in bronchial asthma. Psychosom Med 33:323–340, 1971
7. Straker N, Tamerin J: Aggression and childhood asthma: A study in a natural setting. J Psychosom Res 18:131–135, 1974
8. Pierloot RA, Van Roy J: Asthma and aggression. J Psychosom Res 13:333–337, 1969
9. Bastiaans J: The role of aggression in the genesis of psychosomatic disease. J Psychosom Res 13:307–314, 1969
10. Jacobsen E: You must relax. New York: McGraw-Hill, 1962