1983

Relaxation Therapy as an Adjunct Strategy for the Treatment of Bronchial Asthma: An Examination of Pertinent Psychological and Illness Variables

Robert Joseph Marcello

College of Humanities and Sciences

Virginia Commonwealth University

This is to certify that the thesis prepared by Robert J. Marcello entitled Relaxation Therapy as An Adjunct Strategy for the Treatment of Bronchial Asthma: An Examination of Pertinent Psychological and Illness Variables has been approved by his committee as satisfactory completion of the thesis requirement for the degree of Master of Science.

[redacted]

Albert D. Farrell, Ph.D.
Chairman of Thesis Committee

[redacted]

William M. Kallman, Ph.D.
Committee Member

[redacted]

Ronald D. DeMeersman, Ph.D.
Committee Member

[redacted]

John P. Hill, Ph.D.
Chairman,
Department of Psychology

[redacted]

Elske v.P. Smith, Ph.D.
Dean,
College of Humanities and Sciences

December 16, 1983
Date

Relaxation Therapy as an Adjunct Strategy for the Treatment of Bronchial Asthma: An Examination of Pertinent Psychological and Illness Variables

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at Virginia Commonwealth University.

by

Robert Joseph Marcello

Director: Albert D. Farrell, Ph.D.
Assistant Professor of Psychology

Virginia Commonwealth University
Richmond, Virginia
September, 1983

Acknowledgements

At this time I would like to express my appreciation to several individuals who contributed in various ways to the successful completion of this project. First, for his guidance, expertise, and diligence, I thank Dr. Albert D. Farrell, my advisor and the Chairman of my Thesis Committee. Next, for their support, enthusiasm, and timely assistance and advice, I thank Committee Members Drs. William M. Kallman and Ronald D. De Meersman.

I would also like to thank two colleagues and friends, Stan Shoemaker and Judy Silberg, for their time, effort, and assistance in varous stages of this study, and their constant encouragement throughout. For their cooperation and assistance, particularly in the recruitment of participants for this project, I thank the following: Dee Toney; Mrs. Nellie Garrido; F. Stanford Massei, M.D.; Edward L. Mollen, M.D.; Josephine B. Cader, M.D.; M.E.B. Owens, Jr., M.D.; Franklin P. Mullimax, M.D.; Kent C. Titus, M.D.: and Joseph R. Vilseck, M.D.

Special thanks go to Loverna Boyd and Diana Rawls. While your typing skills were certainly invaluable, your friendship and encouragement were worth a whole lot more.

Finally, for her love, support, patience, and faith in my abilities, I thank my wife, Coco.

Table of Contents

Page

List of Tables

List of Figures

Abstract

Bronchial asthma is described as a relatively common and heterogeneous disorder. The complexity of the pathophysiological process and the myriad of etiological and precipitating factors are discussed. Such factors include: heredity, allergies, and psychological precipitants. The position is taken that regardless of what caused the initial onset of symptoms, psychological factors may contribute to the intractability and severity of the disorder. The utility of Behavior Therapy Techniques such as: Relaxation Therapy, Biofeedback-Assisted Relaxation Therapy, and Systematic Desensitization; as adjunct strategies for the treatment of bronchial asthma is discussed. It is concluded that while each of these arousal reducing strategies can result in statistically and clinically significant improvement, their usage may be restricted by such variables as: asthma type (intrinsic versus extrinsic); asthma severity (nonsevere versus severe); treatment type (mental versus muscular relaxation); and personality type (only two of nine panic-fear subtypes). The objectives of the current investigation were twofold. First, this study was proposed as an attempt to reconfirm the utility of relaxation therapy as an adjunct strategy for the treatment of bronchial asthma. Second, it was intended to examine specific psychological and illness variables which could potentially be useful in predicting responsiveness/unresponsiveness to relaxation therapy. The variables under consideration in this study were asthma severity and panic-fear personality type. Fifteen asthmatics (primarily of the extrinsic type) of varying degrees of severity

and panic-fear personality types were treated in groups with 5 sessions of relaxation therapy. Results on self-report, pulmonary function, and physican ratings partially confirmed the utility of relaxation therapy for treating this population. The results were only suggestive of the importance of severity and panic-fear variables in predicting successful/unsuccessful response to such a treatment strategy. The results are discussed in terms of: 1) Treatment Implications; 2) The use of Psychological and Illness variables as selection criteria; and 3) the necessity of further and larger scale investigations to examine these important issues.

INTRODUCTION

Asthma: Facts About the Disorder

Bronchial asthma is a relatively common disorder, with estimates of its incidence ranging from one to five percent of the general population (Graham et al., 1967; Knapp and Wells, 1978; Williams, 1973). The prevalence of this disorder among children has been estimated as high as fifteen percent (Williams, 1973). Problems associated with asthma result in millions of dollars being spent each year on medical care and additional millions lost due to absenteeism from employment (Dirks et al., 1980; Gold, 1976). Symptoms of asthma can range in severity from a mild wheeze to severe status asthmaticus which can result in death (Olton and Noonberg, 1980). While the death rate associated with bronchial asthma is not high (i.e., it has been estimated at one to two per/200,000; Williams, 1973), it certainly underscores the fact that asthma is an illness which must be dealt with seriously.

Asthma has been described as a heterogeneous disorder which "defies easy categorization (Dirks, et al., 1979a, p. 71)". Precise definitions of this disorder have been called "elusive" (Olton and Noonberg, 1980) and "impossible to develop" (Gold, 1976, p. 203). Gross (1980) offers several reasons why a precise definition of asthma remains so elusive. He states: the "etiology or etiologies are obscure, the clinical picture is diverse, and the pathophysiologic mechanisms are seemingly multiple (p. 203)."

Symptoms

The symptoms generally associated with asthma include: dyspnea (shortness of breath); wheezing; coughing; tightness of chest; and obstructed expiration. These symptoms are the result of narrowed intrapul-

monary airways (Scadding, 1976; Scadding, 1977). This narrowing of air passages is the result of:

> "edema (an accumulation of excess watery fluid in the tissues) of the (bronchial) walls, increased mucuous secretion, spasm of the bronchial muscles, or the collapse of the posterior walls of the trachea and bronchi during certain types of forced expiration (Purcell & Weiss, 1970, p. 597)."

While the symptom complex experienced by most asthmatics is similar, onset may be associated with, or in reaction to several different factors. These include: respiratory infection; exercise; allergies; environmental pollutants; cold air; and emotional distress (American Lung Association, 1977; Evans, 1979; Williams, 1973). It is easy to see how such diversity "defies easy categorization."

Symptom presentation may also differ in terms of course and degree of impairment. For example, certain asthmatics have what has been called episodic asthma. That is, in the absence of an actual asthma attack, their breathing capacity may be no different than non-asthmatics. Thus, decreased respiratory ability is temporary and returns essentially to normal levels once the attack is over. Certain other asthmatics, however, have been described as having more persistent and intractable asthma. That is, even in the absence of an actual attack, their respiratory ability is chronically at a subnormal level. In the face of an attack, breathing capacity is reduced still further and does not return to normal levels once the attack subsides (Olton & Noonberg, 1980; Scadding, 1976; Scadding, 1977).

The presence and severity of asthmatic symptomatology is generally assessed through the use of a variety of measures of pulmonary function. Some of the more commonly used measures include: Peak Expiratory Flow

Rate (PEFR); Forced Expiratory Volume in one-second (FEV_1); Forced Vital Capacity (FVC); and Maximal Mid-Expiratory Flow Rate (MMEFR); (a complete description of these measures can be found under the heading of "Pulmonary Function" in the Method section of this paper). In general, narrowing of the airways will result in decreased values of the above measures (Cherniack, 1977; Gold, 1976).

Clinical Subtypes

Although the clinical picture associated with bronchial asthma has been described as "diverse" (Gross, 1980), asthmatics can usually be classified by subtype according to reliable clinical criteria. Such distinctions are important in that treatment regimens which are highly effective with one subtype may be of limited utility for another. The two major asthmatic subtypes are intrinsic and extrinsic asthma (Scadding, 1976; Scadding, 1977).

Certain asthmatics have been called "extrinsic" because their attacks (i.e., impaired breathing) occur in response to specific, usually readily identifiable, external agents. These external agents come under the heading of allergies and include: pollen; dust; animal dander; and environmental pollutants. The specific allergy or allergies which affect a given individual can be easily identified via an antigen skin test (i.e., this process involves placing drops of specific allergens upon a slightly scratched skin surface. Those allergies which show a positive (wheal and flare) reaction are identified as the culprits).

Within the category of extrinsic asthma, two further subtypes have been identified. These are atopic and non-atopic extrinsic asthma. Atopics can be grouped together because the bronchial hypersensitivity which they experience in response to a number of different allergens is

uniformly mediated by a specific immunoglobin (IgE). It has been suggested that this IgE mediated hypersensitivity is genetically determined because atopic asthmatics tend to have a family history of asthma and other atopic disorders such as hay fever, rhinitis, and eczema (Edfors-Lubs, 1971; Leigh and Marley, 1967). Non-atopics, on the other hand, have neither an IgE-mediated hypersensitivity nor an identifiable family history of asthma (Scadding, 1977). Both are included in the category of extrinsic because the external agents and immunoglobins which mediate bronchial hypersensitivity are readily identifiable. Other commonalities shared by atopic and non-atopic extrinsics are: age at onset tends to be early; symptoms tend to be seasonal (e.g., pollen and ragweed count tend to be higher in the summer), although they may be perrenial (i.e., year round) in certain cases (i.e.,as a function of hypersensivity to a wide range of allergens); in general, symptoms subside in response to bronchodilators such as isoproterenol; and finally, impairment in respiratory ability tends to be temporary and episodic.

The other major category of asthmatics has been labelled "intrinsic". Instrinsics differ from extrinsics in several ways. First, external precipitants cannot be identified (i.e., instrinsics respond negatively to antigen skin tests for allergies). Second, onset of asthma tends to be in adult life. Third, family history of atopic disorders (e.g., hay fever) is not generally found causing investigators to question the role heredity may play among cases of intrinsic asthma (Scadding, 1976). Fourth, symptoms/occurrence of attacks are generally perrenial (i.e., nonseasonal). Fifth, respiratory impairment is usually chronic, persistent and intractable and the prognosis is generally not as favorable as it is for extrinsics. Sixth, intrinsics, as a rule, do not improve dramatically

in response to bronchodilators and the treatment of choice, more times than not, is steroid therapy. And finally, certain intrinsics have been found to be aspirin sensitive, whereas, no such sensitivity has been associated with extrinsic asthma.

Another area where differences have been found between intrinsics and extrinsics is in the psychological literature. For example, instrinsics have been described as being: more "cerebral" (i.e., obsessive) than extrinsics (Cohen, 1977]; more introverted and having more "psychic disturbances" than extrinsics (Teiramaa, 1979a; Teiramaa, 1978a, b and c); and responding more favorably to anxiety reduction strategies such as progressive muscle relaxation (Phillip et al., 1972).

In spite of the above differences between intrinsic and extrinsic asthmatics, there are important similarities. First, intrinsics and extrinsics can be equally severe. Second, both can result in chronic, persistent pulmonary demise. Finally, intrinsics and extrinsics, in severe cases, are treated with a similar medical regimen (i.e., steroid therapy).

Pathophysiology

While the symptom complex experienced by the majority of asthmatics may be similar (e.g., shortness of breath, wheezing), attempting to identify a singular physiological mechanism at the root of these symptoms is a difficult task. As stated earlier, the "pathophysiologic mechanisms (of asthma) are seemingly multiple (Gross, 1980; p. 203)." Although a complete description of the physiological mechanisms involved in bronchial asthma is beyond the scope of this investigation, some understanding of these mechanisms is required to more fully appreciate the heterogeneity and complexity of this disorder.

In general, bronchoconstriction and bronchodilation occur as a function of the antagonistic activities of the two major subdivisions of the autonomic nervous system. These subdivisions are the parasympathetic (PNS) and sympathetic (SNS) nervous systems (Lang, 1972; Wenger et al., 1956). PNS innervation is associated with bronchoconstriction and acetylcholine activity. SNS innervation, on the other hand, can result in either bronchoconstriction or dilation depending upon which adrenergic receptor sites are stimulated by catecholamine (e.g., norepinephrine) activity. Stimulation of the Alpha-adrenergic receptors results in bronchoconstriction while stimulation of the Beta-adrenergic receptors produces dilation. Thus normal, free breathing:

> "is presumably maintained by balancing bronchoconstrictive effects of cholinergic (PNS) and alpha-adrenergic (SNS) stimulation against the bronchodilatory effect of beta-adrenergic stimulation (Williams, 1973, p. 17)."

It can be seen then, that any tipping of this delicate homeostatic balance could result in impaired breathing. Such "tipping" could be the function of either a PNS or SNS malfunction.

In some asthmatics, PNS overreactivity has been implicated as the source of difficulty (Wenger et al., 1956). Evidence in support of this includes: the fact that bronchospasm which normally occurs in reaction to inhalation of certain antigens by allergic (i.e., extrinsic) asthmatics does not occur if PNS innervation is blocked. Such a PNS block can be obtained medically (e.g., by ingestion of a PNS blocking agent such as atropine), surgically (e.g., by severing the vagal nerve associated with respiratory activity), or by cooling either the afferent or efferent (or both) fibers of the vagal nerve (Gold, 1980; Olton & Noonberg, 1980). In addition, stimulation of the PNS pharmacologically (e.g., with metha-

choline or mecholyl) will result in bronchoconstriction. Finally, ingestion of atropine (a PNS blocking agent) in the absence of allergens will result in a slight dilatory effect (Olton & Noonberg, 1980).

Within the SNS there lie several possibilities for malfunction as a result of its dual action of constriction and dilation. For example, a decrease in the sensitivity or activity of beta-adrenergic receptors would result in constriction. Indeed, beta-blocking drugs such as propranolol can cause bronchospasm. Further, Kahn (1973) has suggested that "deficient immobilization of epinephrine (which acts via the beta receptor sites) in response to psychological stress" may be crucial (p. 197). Similarly, hyperactivity or hypersensitivity of the alpha-adrenergic receptors would result in bronchoconstriction. In any case, it seems clear that, at least with regard to underlying physiological pathology, all asthmatics are not created equal.

Medical Treatment of Bronchial Asthma

Prior to discussing actual medical strategies which are used in the treatment of asthma, two points need to be made. First, the type of treatment utilized can vary with the type of asthma which the individual has (e.g., extrinsic versus intrinsic). The reader will recall that Scadding (1976) has suggested that intrinsics and extrinsics may have a differential response to certain bronchodilators (e.g., isoproterenol). Second, that medical treatment of asthma follows the "principal of escalation (Williams, 1973, p. 38)." Thus:

> "The key to successful use of medication in asthma is the principal of escalation, adding more effective, but more hazardous agents only when simpler drugs have not been effective (p. 38)."

One of the most common classes of drugs which are used in the treatment of asthma are the bronchodilators. As a rule, drugs from this class operate via SNS innervation. Examples of these medications include: ephedrine, benzedrine inhalants/aerosols, epinephrine, and isoproterenol. Severe, life-threatening attacks are often treated with injections of epinephrine (Clark & Godfrey, 1977; Lachman, 1972; Williams, 1973). Potential side effects of this class of drugs include the production of a rapid, irregular heartbeat (Evans, 1979).

Another class of medications are those which operate via PNS activity. The reader will recall that the normal action of the PNS is towards bronchoconstriction. Thus, ingestion of anticholinergic drugs such as atropine which blocks PNS innervation of the respiratory system sometimes produce a dilatory effect. A problem associated with the use of anticholinergics, however, is that they may result in the drying of bronchial secretions (Olton & Noonberg, 1980; Williams, 1973).

For more severe cases of asthma, the corticosteroids are commonly used. These include: prednisone, prednisolone, and cortisone (Evans, 1979; Williams, 1973). The side effects of this class of drugs can be serious and include: hindering of growth in children; cataracts; hypertension; depression and even psychosis (Baker, 1979). Recently, steroids have been employed in aerosol form (e.g., beclomethasone; triamcinolone) in an attempt to limit their effects to the bronchial area (Clark, 1977; Evans, 1979).

Another type of medical approach is the process known as immunotherapy. Basically, immunotherapy involves an innoculation procedure which serves to raise an individual's tolerance for certain antigens. The process involves: identifying the appropriate allergens (e.g., via

antigen skin test]; injecting gradually increasing dosages of this substance into the bloodstream over the course of several years. This procedure has demonstrated utility, however, its use is limited to asthmatics of the extrinsic type (Evans, 1979; Williams, 1973).

In certain severe cases surgery may be needed (e.g., severing of vagal nerve fibers), however, it is generally considered to be impractical and the results often do not warrant the risks involved (Gold, 1976; Wenger et al., 1956; Williams, 1973).

Additional treatment recommendations include: remov pets, dust, molds, etc. from the asthmatic's environment; maintain a cool and somewhat humid room temperature (e.g., 35-50% humidity) to prevent the drying out of bronchial passages; drink plenty of fluids; follow a plan of programmed exercises (e.g., swimming); practice breathing exercises (American Lung Association, 1979; Evans, 1979; Williams, 1973).

The Role of Psychological Factors

Psychological factors have been associated with cases of bronchial asthma since Hippocratic times (Leigh and Marley, 1967). This association has been a controversial one throughout the years and opinions have varied regarding the actual role and importance of these factors in the onset and maintenance of asthmatic symptoms. For example, at the turn of the current century asthma was referred to as "asthma nervosa" and psychological variables were considered to be the primary cause of this disorder (Leigh and Marley, 1967). Shortly thereafter the connection between allergies and bronchial asthma was discovered and the "nervous factor fell out of fashion (Leigh and Marley, 1967, p. 2)". At still other times psychological factors were seen as a necessary component of "psychosomatic asthma" in an interactional relationship with genetic, infective,

and allergic factors (e.g., Alexander, 1950).

The precise relationship between psychological variables and bronchial asthma has yet to be clearly defined and, as such, remains the subject of investigation (Clark, 1977). In the following pages I will review the areas of the psychological literature which have made significant contributions to this investigation. In general, these areas can be classified according to whether they view psychological factors as being primarily etiological or maintenance variables.

Etiological Perspective

The Psychoanalytic Approach. The Psychoanalytic position regarding the relationship between psychological factors and bronchial asthma is best represented by the work of Franz Alexander and his colleagues (e.g., Alexander, 1950; Alexander, et al., 1968; and French and Alexander, 1955). Briefly, they state that underlying psychological conflicts interact with other factors (e.g., allergies, infection, genetic predisposition) to produce asthmatic symptoms. Thus, asthma was considered to be a psychosomatic or psychophysiological disorder by this group and psychological factors were thought to play a primary role in the etiology of this disorder.

The underlying conflict associated with the development of bronchial asthma was felt to be an "excessive unresolved dependence upon the mother (Alexander, 1950, p. 133)." In this context, impaired breathing was thought to symbolize a "suppressed cry for the mother (1950, p. 139)." In addition, it was felt that asthmatic symptoms would continue to occur in response to stressful situations unless this underlying conflict was resolved (i.e., via Psychoanalysis).

While the Psychoanalytic position may be an interesting one, it has

never really been rigorously evaluated (Graham, 1972). In addition, it has been criticized because some, but not all asthmatics have been found to have strong dependency needs and because persons with excessively strong dependency needs do not always develop asthma (Blanchard, 1981; Dirks et al., 1979a).

Personality Research. The study of personality variables thought to be related to the inception of asthmatic symptoms has had a great deal of influence upon asthma research. The initial thrust behind this movement was the attempt to demonstrate a connection between specific personality styles and specific psychosomatic disorders. Thus, it was felt that there was an "asthma personality," a "migraine personality," an "ulcer personality" and so on. Based upon clinical observations and psychometric evaluations, the "asthma personality" was described as follows: "immature, insufficiently balanced, passive-dependent, egocentric, and insecure (Bastiaan and Groen, 1955, p. 245)"; emotionally less stable, more sober, serious, tense and frustrated than normals (Agarwal and Setthi, 1978); dependent, meek, anxious, perfectionistic, obsessive, and over-controlled (Cohen, 1977; Plutchik, 1978; Rees, 1964).

Three primary assumptions of this position were: that all asthma was psychophysiological in nature; that psychological factors played a role in the genesis of asthma; and that asthmatics, as a rule were more pathological than so-called normals. In general, none of these assumptions has been conclusively supported by recent research (e.g., Aitken et al., 1972; Rees, 1964). Neither has the notion of a uniform "asthma personality" received much support (Alexander, 1950; Davidson and Neale, 1974; Grinker and Aronson, 1973). Despite the lack of support for an "asthma personality", several authors have noted that substantial subgroups

of asthmatics do seem to possess the common characteristic of being unassertive (e.g., Cohen, 1977; Groen, 1979; Goyeche et al., 1980; Alexander et al., 1968; and Jackson, 1976) and that this inhibited interpersonal style may adversely affect the course, severity, and duration of asthma regardless of whether it contributes to the etiology of asthma (Teiramaa, 1978a; Teiramaa, 1978b; Teiramaa, 1978c;). Kinsman and his colleagues (e.g., 1980a) have also investigated the relationship between specific personality characteristics and the maintenance, severity and intractability of asthma (their work will be reviewed in some detail in an upcoming section entitled "Psychomaintenance"). Thus, while a uniform "asthma personality" may not exist, the study of personality variables and their relationship to asthmatic symptomatology remains a fruitful area of research however, the focus has shifted to more of a maintenance perspective.

Maintenance Perspective

Proponents of this perspective do not attempt to assess the role psychological factors may play in the etiology of bronchial asthma. Rather, the focus is on the ways in which such factors can effect the severity and intractability of the disorder regardless of etiology. Matus (1981) summarized the role of psychological factors in asthma and suggested that they may act in three different ways:

1) Precipitate - emotions can trigger asthmatic attacks due to the respiratory changes which accompany them (e.g., hyperventilation);
2) Exacerbate - once symptom onset has occurred, strong emotional responses such as intense fear can result in worsening of symptoms;

3) Maintain - the response of persons in the asthmatic's environment can serve to reinforce the occurrence of symptoms (e.g., if attacks follow arguments and result in sympathy for the asthmatic, future attacks in response to stressful situations might be inadvertently reinforced). This category is particularly applicable to the child asthmatic.

It should be noted that this de-emphasis upon the etiological role of psychological factors in bronchial asthma is consistent with the DSM-III redefinition of what were formerly known as psychosomatic disorders (which implies a psychological role in the etiology of the disorder) into the category of "Psychological Factors Affecting Physical Condition (1981, p. 171)." Two areas of asthma research which best exemplify this maintenance perspective are described below.

The Behavioral Approach. The primary focus of the Learning/Behavioral tradition has been upon the relationship between environmental stimuli and onset of asthmatic symptoms. This relationship has been demonstrated in several ways.

First, it has been shown that classical conditioning can result in an expansion of the number of environmental cues which can come to elicit an attack. For example, if asthmatic symptoms are initially in response to an allergic agent (e.g., a feather pillow or dust in a bedroom), after repeated pairings of neutral objects in the room (CS) with asthma attacks (UCR), these previously neutral objects (e.g., bed, mattress, rug) may come to elicit attacks even after allergenic substances (UCS) have been removed (e.g., Dekker et al., 1957; Cohen, 1977; Spevack, 1978). Second, this same classical conditioning process can, over time, result in patients'

reacting to the cues which signal the initial onset of an attack with fear/anxiety in anticipation of a full-blown attack. This fear response, then, may adversely effect the respiratory system (e.g., hyperventilation) and may either trigger an attack or increase the severity of an attack which may have occurred in any event. As a result of the conditioning process, a vicious cycle may ensue in which severe attacks beget fear, which subsequently beget more serious attacks, etc. (Cohen, 1977; Matus, 1981; Williams, 1973). Behavioral interventions such as relaxation therapy and systematic desensitization are thought to be of benefit to certain asthmatics because they serve to "short-circuit" this vicious cycle by reducing physiological arousal levels (Spevack, 1978).

Operant conditioning can also contribute to the maintenance and onset of asthmatic symptoms. It has been suggested (e.g., Matus, 1981) that the frequency of asthma attacks might be inadvertently increased if such attacks result in extricating the asthmatic from stressful or undesirable situations. This "secondary gains" notion has been stressed particularly with regard to childhood asthma. In this vein, such things as: increased parental attention; avoidance of school; and avoidance of unpleasant chores have been mentioned as potentially "rewarding" for the child asthmatic (Evans, 1979; Williams, 1973).

A final way in which environmental events can effect the occurrence of asthmatic symptoms is the modelling process. Several authors have noted that the inappropriate response of parents (e.g., panic, overprotectiveness) to the child's asthmatic symptoms might serve to: foster dependency (Evans, 1979); promote an "unnecessary attitude of invalidism" (Williams, 1973, p. 70); and in general present the child with a poor role model for coping behavior. The reader will note that such a process

could result in a vicious cycle similar to the one noted in conjunction with classical conditioning (i.e., attack produces anxiety which worsens the attack and so on). As such, most physicians advise parents to remain reasonably concerned, but calm, in response to their child's attacks (Weiss, 1981).

Psychomaintenance. Kinsman and his associates (e.g., Kinsman et al., 1980a; Jones et al., 1979) have defined Psychomaintenance as the process by which:

> "...psychologic and behavioral factors maintain and increase both the severity and medical intractability of the illness once it has already developed (Kinsman et al., 1980a, p. 3)."

They state further that such factors serve to impede "medical treatment which is effective in most other cases (p.3) " and that these psychomaintenance issues must be addressed if the patient is to achieve the maximum benefit from medically oriented treatment.

Kinsman et al. (1980a) assume "that the patient brings to the illness a personal style that may either defeat, have no effect upon, or facilitate medical management (p. 11)." In an impressive series of studies (e.g., Dirks et al., 1978; Jones et al., 1979; Kinsman et al., 1980a), these authors have investigated one such style which they suggest contributes to the intractibility of asthmatic symptoms. They have labelled this the Panic-Fear personality style.

According to these authors, asthmatics can be categorized into Low, Moderate, and High levels of panic-fear through the use of psychometric instruments (e.g., the Asthma Symptom Checklist, and the 20 P-F). Low panic-fear patients have been described as symptom minimizers; moderate panic-fear patients as adaptive and healthy; and High panic-fear patients

as symptom maximizers (i.e., over-reactors). Both extremely Low and High levels of panic-fear are viewed as being maladaptive because they serve to interfere with medical treatment which is normally very effective. Panic-fear level has been consistently related to such things as: non-compliance with medication instructions; intensity of discharge medication level; length of hospital stay; and probability of re-hospitalization; independent of the severity of one's asthma (Dahlem et al., 1977; Dirks and Kinsman, 1981; Dirks et al., 1977a; Dirks et al., 1978b; Kinsman et al., 1980d; Klieger and Dirks, 1979).

Panic-fear is assessed on two levels: symptom vigilance and personality. Symptom vigilance is measured with the ASC and Low levels are considered maladaptive (i.e., patient ignores severity of symptoms). Panic-fear personality is measured with the 20 P-F and both Low and High levels are considered to be maladaptive (i.e., Low P-F patients under-react to severity of symptoms; High P-F patients panic and over-react). Utilizing these two measures, 9 asthma subtypes have been identified (i.e., 1) Low vigilance - Low Personality; 2) Low-Moderate; 3) Low-High; 4) Moderate-Low; 5) Moderate-Moderate; 6) Moderate High; 7) High-Low; 8) High-Moderate; 9) High-High) and each subtype carries with it different treatment needs and recommendations. For example, categories 5 and 8 are said to be comprised of "good" patients who do not require psychological intervention regarding psychomaintenance issues. Categories 1, 2, and 4 are of the Low panic-fear type, and it is felt that a strategy which focuses upon their denial/counterdependence issues and educates them regarding the importance of attending to their symptoms would be helpful. Finally, categories 6 and 9 are of the High panic-fear type, and Kinsman and his colleagues recommend an intervention strategy which will:

1) help patients perceive they are not powerless; 2) teach them appropriate means of personal control over illness (i.e., improve coping skills); 3) teach them to control their reactions (i.e., panic) to their illness (Dirks et al., 1979a; 1979b). (Because of the inadequate number of patients involved, Kinsman et al. (1980a) were not able to offer treatment suggestions for patients in categories 3 and 7). Of particular interest to the current study is the suggestion by Kinsman et al. (1980b) that anxiety reduction strategies such as relaxation therapy are indicated only for these latter two panic-fear subtypes (i.e., 6) Moderate-High and 9) High-High) and that relaxation approaches may, in fact, be detrimental to asthmatics with other panic-fear styles (e.g., Low-Low; Low-Moderate; Moderate-Low).

Summary

Several conclusions can be drawn regarding the relationship between psychological factors and bronchial asthma. First, although psychological factors have been implicated in the etiology of asthma, such a role has not received widespread support. Second, regardless of the etiology of asthmatic symptoms, psychological factors can serve to: precipitate exacerbate, and maintain the severity of these symptoms. In addition, psychological (i.e., psychomaintenance) factors can interfere with normally effective medical care if ignored.

Thus, while psychological factors may not necessarily play a role in every case of bronchial asthma, failure to evaluate their potential effects may result in less than optimal control of symptomatology. Indeed, several authors have stressed the importance of a cooperative/ holistic approach in both the assessment and treatment of asthmatic patients. For example, Cohen (1977) states:

> "All aetiological aspects, infective, allergic and emotional - should as far as possible be treated simultaneously and management of the patient jointly by the psychiatrist and the physician can be very rewarding. It is important to remember that an illness may start mainly as allergic, and later emotional or infective factors may become dominant in determining whether attacks occur (p. 183)."

Similar views regarding a cooperative approach to treatment have been offered by others (e.g., Blanchard and Ahles, 1979; Goyeche et al., 1980; Leigh & Reiser, 1977; Miklich, 1979). In this vein, psychological interventions can be seen as attempts to assist, not replace, medical management of bronchial asthma. We turn now to the discussion of specific psychological strategies which have been employed for the treatment of asthma.

Psychological Treatment of Bronchial Asthma

General

Given the degree to which psychological factors have been implicated in both the etiology and maintenance of bronchial asthma, it is not surprising that a variety of psychologically-oriented strategies have been employed as primary or adjunct treatments for this disorder. A number of such strategies have been evaluated and determined to have varying degrees of success.

In that Alexander (1950) has been a major figure in the area of psychosomatic disorders, it is not surprising that strategies based upon his Psychoanalytic approach to the treatment of asthma can be found in the literature. Alexander (1950) reported the successful use of Psychoanalysis in treating the unresolved dependency needs of the asthmatic. Similarly, Jackson (1976) reported success in case studies which employed psychodrama for the treatment of asthma. He noted that this approach seemed to promote a cathartic effect which was beneficial to the asthmatic. Finally,

Knapp (1980) has reported that the free association technique can be used successfully with asthmatics. He states that the asthmatic's "need to cling and fuse" is at the core of his/her disorder and should be the focus of treatment.

Following the lead of the Psychoanalytic approach which stresses the importance of parent-child relationships in the genesis of asthma, several authors have reported success in treating child asthmatics with a family therapy orientation. Examples of this approach include: Abramson and Peshkin (1978); Groen and Pelser (1960); Minuchin et al. (1975); Pinkerton (1967); and Piazza (1981).

With a somewhat similar emphasis upon the role which family difficulties may play upon asthma, several authors have reported that asthmatic symptoms subside following a "parentectomy" (i.e., the removal of the patient from the home situation). Such a strategy obviously is reserved for more severe cases (Bastiaans & Groen, 1955; Grinker & Aronson, 1973; Lewis & Lewis, 1972; Purcell et al., 1969).

Still other approaches which have been reported as being helpful with asthmatics include: Hypnosis (Collisson, 1968; Leigh & Marley, 1967): Rogerian therapy (Anderson, 1978; Kleeman, 1971); Yoga (Goyeche et al., 1980); and increasing speech activity (Mook & van der Ploeg, 1980). This last study is of particular interest in that it serves as at least indirect support for use of assertiveness training with asthmatics. These authors noted that expiration improved when patients were encouraged to verbalize freely and that it did not improve when they were forced to listen or were interrupted.

Finally, some authors have suggested that the success of psychologically oriented treatments with asthmatics may be largely based upon an

expectancy effect. For example, Aitken et al. (1972) state: "It looks as if this contact (i.e., psychologically oriented) need be little more than minimal, i.e., sufficient only to make clinical observations (p. 375)." While the potential for placebo effects certainly cannot be overlooked in asthma-treatment research, the fact that a myriad of studies (primarily in the Behavior Therapy literature) have demonstrated active and significant treatment effects when compared with appropriate no-treatment control groups suggests that the above authors may be overestimating the power of such effects (Knapp & Wells, 1978; Spevack,1978).

Behavioral

Behavior therapists have been involved in the treatment of bronchial asthma for over 20 years (see Walton, 1960). During this period a considerable amount of research has evaluated the utility of a variety of behavioral strategies for use as adjunct treatments for this disorder. Such strategies have included: various forms of biofeedback (Danker et al., 1975; Kahn et al., 1973; Scherr et al., 1975); progressive muscle relaxation (Alexander, 1972; Alexander et al., 1972); systematic desensitization (Cooper, 1964; Sergeant and Yorkston, 1969): and assertiveness training (Walton, 1960; Hock et al., 1978). In general, those strategies which include some form of relaxation training have been found to be effective on variables such as: decreased frequency, duration and intensity of asthma attacks; decreased medication usage and emergency room visits; and increased respiratory functioning (the reader is referred to: Blanchard & Ahles, 1979; Knapp & Wells, 1978; Erskine-Millis & Schonell, 1981; and Spevack, 1978 for excellent reviews of this literature). Stated simply, the rationale for the effectiveness of such strategies is that since strong autonomic arousal has been shown to have

adverse effects upon asthmatic symptoms (e.g., Matus, 1981), reduction of such arousal levels should prove beneficial (Kinsman et al., 1980b; Spevack, 1978).

Despite substantial evidence which supports the use of relaxation-type strategies for the treatment of asthma, several studies have questioned the blanket applicability of these techniques. For example, it has been suggested that these techniques may only be successful with asthmatics who: 1) are of the intrinsic versus extrinsic type (Phillip et al., 1972); 2) are of mild to moderate severity (Davis et al., 1973); and, 3) have a specific psychomaintenance style (e.g., Moderate to High in terms of panic-fear symptom vigilance, High in terms of personality; Kinsman et al., 1980b). In addition, some researchers have suggested that only "mental" (i.e., autogenic training; meditation) as opposed to traditional muscular relaxation techniques result in any real clinical improvement. Thus, it seems that many issues remain unresolved. In the following discussion I will review the evidence, both pro and con, concerning the use of arousal reduction strategies such as relaxation training for the treatment of bronchial asthma.

Supportive Data. Evidence which supports the efficacy of relaxation techniques can be found in several areas. These include studies which have evaluated traditional progressive muscle relaxation (or variants of this procedure such as autogenic training and meditation) both in isolation and in conjunction with additional treatment components (e.g., desensitization hierarchies; frontalis electromyograph (EMG) feedback).

Studies in which relaxation training of the Jacobsonian muscle-tense-relax type was evaluated in isolation have consistently resulted in significant improvement. For example, Alexander et al. (1972) reported

significant changes in PEFR levels of treated versus non-treated asthmatics after an average of less than five sessions. Alexander (1972), reported similar success after an average of approximately four 30-minute sessions of such training. In each of these studies moderate to severe asthmatic children were used as subjects and improvements in PEFR averaged over 20 liters/minute (an improvement of approximately 11%).

Several studies have employed variants of "traditional" relaxation and met with similar success. For example, Wilson et al. (1975) treated subjects with Transcendental Meditation and observed significant changes on self-report (e.g., self-rating of symptom severity) and pulmonary function measures (e.g., FEV_1, PEFR) for treatment as compared to control subjects. Similarly, Schwobel (1948) used a treatment strategy which employed an autogenic training component (i.e., autogenic training involves self-suggestion that muscles are heavy and warm) and "showed subjective and objective improvement in 42 out of 50 patients (Erskine-Millis & Schonell, 1980, p. 367)."

A recent trend in the use of relaxation strategies has been their employment as active coping skills as opposed to passive techniques by which one can reduce overall levels of physiological arousal. In this type of procedure, subjects are taught not only to practice relaxation on a daily basis, but also to use such skills actively to maintain their composure when faced with the initial cues of an oncoming attack. In one case study, Rathus (1973) taught a 22-year-old asthmatic relaxation skills and then encouraged her to welcome rather than fear the onset of her symptoms and to view each attack as an "opportunity to prove to herself that she could deal effectively with them (p. 31)." He reports that the patient remained symptom-free for two years after treatment.

Sirota and Mahoney (1974) treated a 41-year-old woman with a thirty-four year history of asthma using a relaxation as coping strategy and reported that, after nine sessions, she was able to: reduce the frequency of usage of her portable nebulizer to almost zero; decrease the usage of steroid medications, and similarly reduce her usage of additional asthma medications. Improvement was maintained at a two month follow-up. Sichel et al. (1973), reported similar success in still another study in which relaxation was employed as an active coping skill with asthmatic children. It should be noted that the success of relaxation as a coping strategy may be a function of both the direct effects of decreased arousal upon lung functioning and the indirect effects of the patient's increased confidence in his/her ability to cope with, and have a certain degree of control over, asthmatic symptoms (as Kinsman et al., 1980a might suggest).

Relaxation therapy has also been employed with asthmatics in conjunction with frontalis EMG biofeedback. This EMG- assisted relaxation training involves teaching subjects some systematic method of relaxing (e.g., progressive muscle relaxation) while providing them with ongoing feedback which purportedly demonstrates the success of their efforts (e.g., lower EMG levels reflect decreased muscle tension as a function of relaxation exercises). To date, a fair number of studies have demonstrated the efficacy of this technique. For example, Scherr et al. (1975) provided asthmatics with frontalis EMG-assisted relaxation training and, after 15 sessions, treated subjects showed improvement on the following variables as compared to a control group: reduced number of infirmary visits; decrease in number of attacks; reduced steroid usage and an almost two-fold improvement in Peak Expiratory Flow Rate. It is interesting to note

that both treatment and control subjects were children at a summer camp which specialized in the intensive treatment of asthmatics, thus, the gains realized can be seen as above and beyond what could be attributed to the other components of the camp's treatment regimen. Kotses et al. (1976) and Kotses et al. (1978) demonstrated similar improvement, including improved PEFR, using EMG-assisted relaxation training.

One case study (Lerro, 1980) reported successful treatment of an asthmatic with a multicomponent package which included EMG-assisted relaxation training and finger-temperature feedback. While the rationale for inclusion of finger-temperature feedback was not given, the patient did improve. However, since the treatment program also included a component with demonstrated efficacy, there is no way one can assess the added benefits of this package.

This author was able to find only one study which compared EMG-assisted relaxation training with relaxation training alone and a no treatment control. Davis et al. (1973) carried out this study and reported significant improvement in the treatment groups as measured by PEFR. In addition, they report that EMG feedback resulted in still further gains over relaxation training alone. It is interesting to note, however, that these results held only for subjects who had been defined as non-severe asthmatics and not for severe patients. In this case, severity/nonseverity was determined according to the presence or absence of steroid therapy (recall that steroids are reserved for use only in more severe cases). On the basis of these findings, Davis et al. suggested that relaxation-type strategies might be of limited utility for severe asthmatics. One problem with this conclusion, however, is that a severity/nonseverity distinction based upon medication alone does not insure that one is also

differentiating between asthma type. As stated previously, both intrinsic and extrinsic asthma can be equally severe and require steroid therapy. In addition, since it has been suggested that intrinsics and extrinsics may respond differentially to relaxation training (e.g., Phillip et al., 1972 suggest that intrinsics respond more favorably), conclusive statements cannot be drawn from these results. It may be that the treatment sample in this case was composed of a mixed group of asthma types which could have resulted in a "washout" effect among severe asthmatics. In addition, it is entirely possible that all treatment groups did not contain an equal number of intrinsic and extrinsic asthmatics. As a result, the EMG-assisted groups may have had an advantage over the relaxation only groups due to chance assignment of intrinsics to these groups.

One final area of research supporting the efficacy of relaxation-type techniques with bronchial asthmatics is the systematic desensitization literature. Since systematic desensitization (SD), as defined by Wolpe (1973) includes progressive muscle relaxation as a major component of treatment, it is not surprising that it has been employed effectively with asthmatics. While the rationale of each approach can be viewed as similar (i.e., to help the patient decrease emotional arousal associated with symptom onset), these approaches do differ. The major difference between these strategies is that relaxation provides the patient with a skill which can result in generalized anxiety reduction, whereas, SD attempts to systematically reduce arousal associated with <u>specifically identified</u> cues associated with symptom onset. This systematic anxiety reduction is achieved by having the patient imagine himself in a stressful situation while maintaining his/her body in a relaxed state. It is theorized by some that this more specific arousal reduction is the reason

for the apparent superiority of SD to relaxation alone. For example, Spevack (1978) states:

> "Perhaps the superiority of desensitization over relaxation is due to the fact that the initial asthma symptoms are involved in the desensitization hierarchy (albeit in a passive way), and this enhances the likelihood that an individual will relax during the initial phase of an attack (1978, p. 325)."

Several studies which demonstrate the efficacy of this technique will now be discussed.

As previously stated, SD involves the pairing of asthma-related situations (in imagination) with a relaxed bodily state. According to Knapp and Wells (1978), standard items of an SD hierarchy include such things as: fighting for one's breath and fearing one might die. While it is felt that many asthmatics will experience similar levels of anxiety associated with items on the standard hierarchy, most authors recommend the use of individualized hierarchy items whenever possible (e.g., Knapp & Wells, 1978; Moore, 1965; Spevack, 1978).

The efficacy of SD with asthmatics is well documented. For example, Cooper (1964) used SD to treat a 24-year old severe asthmatic. After 12 sessions, the subject reported experiencing only 4 attacks over a period of 16 months. Cooper felt that the key ingredient of change was the patient's improved ability to remain calm in previously anxiety eliciting situations. In another case study, Sergeant and Yorkston (1969) effected similar improvement with a 26-year old asthmatic after only eight sessions. This patient was reported as being symptom-free for five years following treatment. While such results are encouraging, they can be taken as only suggestive evidence of the efficacy of SD due to their limited scope.

In a larger study, Moorefield (1971) treated nine subjects with an SD package which substituted hypnosis for the relaxation component. After

an average of just over 13 sessions, all patients improved on self-report measures and in terms of medication usage patterns (i.e., medication usage decreased). Unfortunately, neither pulmonary function nor follow-up data were reported in this study.

In studies which have compared SD with relaxation training only, SD has consistently been found to be superior (Blanchard & Ahles, 1979; Knapp & Wells, 1978; Spevack, 1978). For example, Moore (1965) compared relaxation only, relaxation plus positive suggestion (i.e., "you're handling your attacks well"), and relaxation plus SD on a group of 12 asthmatics. While all treatments resulted in improvement in terms of decreased frequency of attacks, only the SD plus relaxation group improved on measures of respiratory function. These differences were maintained at a 6-month follow-up.

In a similar study, Yorkston et al. (1974) treated 14 asthmatics with either relaxation training or SD plus relaxation training. After only 6 sessions, subjects in the SD group demonstrated significantly greater improvement in terms of reduced medication usage and pulmonary function increases (e.g., % predicted FEV_1 rose from 56 to 76%). Results were maintained at a two year follow-up.

No studies were found which compared SD with relaxation as coping (which might be viewed as a type of "in vivo" desensitization procedure), and Spevack (1978) has suggested that such an investigation would be a fruitful undertaking. In addition, no studies have specifically compared SD to various biofeedback techniques. Knapp and Wells (1978) have suggested, however, that since biofeedback techniques have not been found to be clearly superior to relaxation training, and since SD has demonstrated such superiority over relaxation, we might expect similar results in a study which compared SD with biofeedback. In any event, most authors

attest to the superiority of SD over other behavioral techniques at this point in time (e.g., Blanchard & Ahles, 1979; Erkskine-Millis & Schonell, 1981; Knapp & Wells, 1978; Spevack, 1978).

At the present time, the following conclusions regarding the use of relaxation-type approaches for the treatment of bronchial asthma can be made: whether traditional muscle-tension or variants are employed; whether these strategies are used in an active or passive manner; and whether they are used in isolation or in conjunction with SD hierarchies or EMG-feedback; the data seems to consistently support the use of relaxation-type (i.e., arousal reducing) techniques as adjunct treatments for bronchial asthma. Further work is needed, however, to determine such things as: whether EMG-feedback is a significant addition to systematic relaxation techniques; whether active relaxation is superior to passive relaxation; and the comparative efficacy of SD and EMG-assisted techniques.

Restrictive Data. Despite the overwhelming evidence which supports the use of arousal reduction strategies such as biofeedback, relaxation, and systematic desensitization as adjunct treatments for bronchial asthma, several studies have questioned their blanket application and have suggested that their utility may be limited. In general, these studies can be seen as attempts to identify more precisely which type of patients (i.e., asthmatics) will respond favorably to what intervention technique(s) (Kiesler, 1966; Paul, 1970).

Phillip et al. (1972) is the only study in the asthma treatment literature which has systematically examined the effects of arousal reduction strategies such as relaxation therapy upon different asthma subtypes (i.e., intrinsic versus extrinsic). In this study, asthmatic type was determined by reaction/nonreaction to an antigen skin test (recall

that extrinsics respond positively to such a test and intrinsics do not). On the basis of this determination, 20 subjects were assigned to each of the following groups: 1) Intrinsic-Relaxation; 2) Intrinsic-No Relaxation; 3) Extrinsic-Relaxation; 4) Extrinsic-No Relaxation. After five sessions of relaxation training, the following results were obtained: 1) an overall relaxation effect was observed as 7 out of 10 relaxation subjects improved on measures of pulmonary function (e.g., FEV_1), whereas, no control subjects showed such improvement; 2) When the data were evaluated individually (i.e., subject by subject), they found that the largest improvements occurred among the Intrinsic asthmatics treated with relaxation. As such, they suggest that relaxation may be more effective with intrinsic asthmatics.

Several points need to be made based upon these results. First, given the potential importance that an illness variable such as asthma type could have upon the selection of appropriate treatment strategies for use with asthmatics, it seems clear that the results of Phillip et al. require replication. Second, since all of the subjects in this investigation were rated as nonsevere asthmatics, such replication efforts should attempt to extend these findings to more severe asthmatic populations. Finally, pending the outcome of such efforts, it would seem necessary for asthma-treatment researchers to account for such a potential moderator variable when assessing the efficacy of their results.

Davis et al. (1973) have also suggested that the use of arousal reduction strategies may be restricted on the basis of asthma severity (i.e., such strategies may only be effective with mild to moderate asthmatics). However, since severity in this study was determined solely on the basis of medication needs it is not all clear whether this

also resulted in subjects being differentiated according to asthma type (i.e., intrinsic versus extrinsic; recall that both of these types require steroids in severe cases). If, as suggested by Phillip et al. (1972), intrinsics and extrinsics respond differentially to relaxation training (i.e., intrinsics respond more favorably), it is quite possible that the equivocal results obtained in the Davis et al. (1973) study were the function of a "wash out effect" due to the presence of both intrinsic and extrinsic asthmatics in the severe group. Indeed, these authors commented that:

> "Extreme response variability displayed by members of the severe group accounts for the lack of significant improvement in the group (p. 126)."

Such "extreme variability" is exactly what one would expect from a group composed of different asthma types. At this point, then, the limitations suggested by Davis et al. (1973) cannot be accepted as conclusive. Such conclusions may only be drawn when these findings are replicated in a study which either examines both asthma type and severity simultaneously or systematically controls for asthma type. It may be that a more adequately controlled study will demonstrate that relaxation strategies can be used with severe asthmatics who are of the intrinsic type.

Following a rationale similar to Davis et al. (1973), Alexander et al. (1979) attempted to evaluate the usefulness of relaxation training with severe asthmatic children. In what these authors called a confirmation of the results of Davis et al. (1973), no significant improvements were obtained by these subjects in response to relaxation. These authors went further and suggested that since relaxation theoretically operates via PNS innervation and that PNS innervation also can result in bronchoconstriction, we shouldn't expect that relaxation would be effective

with asthmatics, rather, we should anticipate a worsening of symptoms.

The results of this study can be criticized upon several grounds. First, like Davis et al. (1973) these authors failed to differentiate subjects according to asthma type. In fact, because the subjects were all under 15 years of age, and the onset of intrinsic asthma tends to be in adult life, one could speculate that these subjects were of the extrinsic type and as such, might not be expected to respond favorably to relaxation training. Further evidence of the probability that at least some of these subjects were of the extrinsic type can be found in the facts that: 1) All the subjects showed reversibility of symptoms in response to bronchodilators; 2) Only some of the subjects were on corticosteroids. The reader may recall that intrinsic asthmatics, as a rule, do not respond to bronchodilators and, as such, generally require steroid therapy. Another criticism of this investigation is the fact that some research has demonstrated that relaxation strategies are difficult to implement successfully with children because of the attention and concentration required (e.g., Hatzenbuehler and Schroeder, 1978). As such, the four sessions of relaxation given to subjects in this study may not have been adequate to achieve appropriate levels of arousal reduction. The final, and perhaps most important, criticism is that, in challenging the theoretical rationale of relaxation therapy these authors have apparently assumed that the bronchoconstriction associated with asthma is caused uniformly by PNS activity. As was stated previously (in the Pathophysiology section), the respiratory system does not operate in such a straightforward manner (i.e., constriction may be a function of: PNS overreactivity; SNS - beta adrenergic hypoactivity; SNS-alpha adrenergic hyperactivity). It is entirely possible that relaxation therapies may be

effective with certain asthmatics because they serve to minimize the physiological arousal which may be adversely effecting the SNS-adrenergic receptors in the first place. In any case, it seems clear that the use of relaxation - type strategies cannot be contraindicated on the basis of a methodologically flawed investigation and an overly simplistic conceptualization of respiratory physiology.

In addition to illness variables such as asthma type and severity, some authors have suggested that the use of arousal reduction strategies may be restricted on the basis of psychological variables. As Kinsman et al. (1980b) state: "Asthmatic patients simply are not a homogeneous psychological group (p. 403)." Along these lines, Kinsman and his associates (1980a) have identified 9 different asthmatic personality subtypes via the use of psychometric instruments (i.e., the ASC and the 20 P-F).

According to these authors, arousal reduction strategies are indicated for only two of these 9 subgroups; i.e., Moderate-High and High-High (recall that moderate to high levels of symptom vigilance are considered adaptive whereas only moderate levels of panic-fear personality are adaptive). These authors also state that arousal reduction strategies are contraindicated for patients who measure low on symptom vigilance (i.e., Low-Low; Low-Moderate; Low-High). This is based on the assumption that relaxation in these cases might serve to decrease an already maladaptive level of symptom vigilance (Kinsman et al., 1980b; Staudenmayer et al., 1979). While these authors present a convincing rationale for the restriction of arousal reduction strategies to use with specific patient subtypes, to this date, no study has specifically evaluated their hypotheses.

One final qualification on the use of arousal reduction strategies with asthmatics concerns the method by which such arousal reduction is

achieved. Evidence to date has, for the most part, supported the use of a variety of approaches to relaxation training. Erskine-Millis and Schonell (1981) have challenged this blanket endorsement in a recent review. They state:

> "...muscular relaxation alone appears to be ineffective in the treatment of asthma, however, mental relaxation techniques, such as autogenic training and transcendental meditation, seem to produce clinically and statistically significant improvement in pulmonary function and subjective measures (1981, p. 368)."

A review of the studies which these authors based this conclusion on suggests that this conclusion is premature. For example, to support the ineffectiveness of muscular relaxation these authors cite three studies which have been reviewed previously in the current paper. These studies are: Alexander (1972); Alexander et al.(1972); and Alexander et al.(1979). As previously discussed, the results of the Alexander et al. (1979) study cannot be considered conclusive because of several shortcomings; e.g.: failure to differentiate according to asthma type; use of children for subjects. Both the Alexander (1972) and the Alexander et al. (1972) studies can be criticized for these same shortcomings. In addition, Erskine-Millis and Schonell state that while these later two studies did report statistically significant results, improvements achieved on PEFR measures were only 11% and less than 15% is considered clinically insignificant. While this criticism is an appropriate one, these authors fail to report that in each of these studies there was extreme response variability of the type reported in the Davis et al. (1973) study earlier. For example, Alexander (1972) reported that: the top third of his subjects improved over 35%; the middle third improved only 5%; and some of the bottom third actually deteriorated. Again, such results are consistent with what one would expect of a heterogeneous treatment population made up of both intrinsic and extrinsic asthmatics.

A second challenge which can be leveled against their conclusion regarding the effectiveness of "mental" techniques is the fact that, for the most part, none of these studies involved a direct comparison between mental and muscular techniques (e.g., recall Schwobell, 1948 and Wilson et al., 1975). As such, it would seem difficult to pronounce these techniques as superior regardless of how effective they may be.

Finally, in the one study they cite as a direct comparison between muscular and mental techniques, neither technique was found to be effective (Erskine and Schonell, 1979)! In addition, this study was also plagued by the following methodological problems: First, subjects were not controlled in terms of asthma type. Second, in attempting to establish a neutral expectancy set for these subjects, it seems that these authors may have actually established a negative set (i.e., subjects were told that the "effects of relaxation therapy on asthma are unknown").

In summary, while these authors have raised a pertinent treatment issue which certainly warrants investigation, it seems far too premature to list muscular relaxation techniques in the obituary column.

Conclusions and Recommendations. At the present time, the following conclusions can be drawn regarding the use of arousal reduction techniques such as relaxation therapy with bronchial asthmatics: 1) The blanket application of these strategies has been challenged on several grounds, however, no challenge has been strong enough to seriously restrict their usage at this time; 2) Several variables have been suggested as potential areas of restriction (e.g., illness type; illness severity; treatment type; personality type), however, no study to date has adequately evaluated even two of these variables simultaneously; 3) Pending further and more adequately controlled research into these areas, statements concerning

the "blanket indictment of anxiety reduction techniques in asthma" and the "indictment of blanket application" (Kinsman et al., 1980b) of such techniques cannot be made conclusively.

Given the importance of the issues and challenges which have been raised by the above authors, such investigations must be implemented if further progress is to be made in this area of the asthma-treatment literature. What appears to be called for, then, are a series of multifactorial evaluations which will examine the following variables (minimally) in a systematic fashion: 1) Intrinsic versus Extrinsic asthma type; 2) Nonsevere versus Severe intensity; 3) Muscular versus Mental Relaxation strategies; 4) Panic-Fear asthma subtypes. The present study represents an initial step in this series.

The Present Study

The objectives of the current investigation were twofold. First, this study was proposed as an attempt to reconfirm the utility of relaxation therapy as an adjunct strategy for the treatment of bronchial asthma. Second, it was intended to examine specific psychological and illness variables which could potentially be useful in predicting responsiveness/unresponsiveness to such a treatment strategy. The specific variables which were examined in this study were asthma severity and panic-fear personality type. It had been intended that the asthma type variable (i.e., intrinsic versus extrinsic) would also be examined, however, the final subject sample consisted of either extrinsic asthmatics or mixed asthmatics who were primarily influenced by extrinsic factors. As such, this study controlled for, rather than systematically evaluated this important factor. Similarly, all subjects who participated in this

program received identical treatment (i.e., relaxation therapy included muscular, mental, passive, and active coping components). Thus, questions pertaining to the most effective form of relaxation (i.e., mental or muscular) were not addressed.

Hypotheses

Several hypotheses were made for each of the stated objectives of this investigation. These hypothesized results, as expected across several assessment domains (i.e., self-report; pulmonary function; physician ratings), are summarized below.

Treatment Efficacy

First and foremost, it was predicted that all subjects who participated in this program would demonstrate the acquisition of the relaxation skill as indicated by decreased self-ratings of tension/relaxation following all treatment sessions. Assuming the acquisition of this skill, it was also hypothesized that relaxation therapy would effect the following outcomes:

1) Decreased frequency, duration, and intensity of asthma attacks;
2) Decreased medication usage as indicated by physican ratings and self-monitoring data;
3) Improved respiratory functioning as indicated by several pulmonary measures;
4) Decreased scores on the symptom vigilance or "state" measure of panic-fear (i.e., as measured by the ASC);
5) Decreased feeling of helplessness in response to asthmatic symptoms as indicated by decreased scores on the panic-fear "trait" measure (i.e., the 20 P-F).

Variables Related to Outcome

The following hypotheses were made regarding the predictive ability of asthma severity, panic-fear personality type, and compliance to treatment instructions:

1) Panic-fear personality type (i.e., as determined by scores on the ASC and the 20 P-F) will be significantly related to favorable outcome. Specifically, it is expected that "high" panic-fear types will respond more favorably to relaxation therapy than "low" or"moderate" types;

2) Asthma severity will be significantly related to favorable outcome. Specifically, it is expected that nonsevere extrinsic asthmatics will respond more favorably to relaxation therapy than their severe counterparts;

3) The degree to which subjects comply to treatment instructions (as indicated by the amount of time spent practicing relaxation training) will be positively related to improvement in their asthmatic symptoms.

Method

Subjects

Source. Subjects were volunteers recruited from one of two sources: 1) An Adult Allergy Clinic affiliated with the Medical College of Virginia; 2) The caseloads of private physicians who treat asthmatics in the Richmond Metropolitan area. The recruitment procedure varied slightly according to the source of the subjects. For example, at the Adult Allergy Clinic recruitment was done directly by the principal investigator. As patients came for their regularly scheduled appointments, they were asked by the staff if they would object to speaking with someone about a research project involving asthmatic patients. The project was then described to those consenting patients and the names and phone numbers of persons interested in participating were recorded. By contrast, recruitment at the physicians' offices was generally done personally by the physician or a member of his/her staff. The typical procedure involved the physician and/or staff member briefly describing the project to persons in their caseload whom they felt would either be interested in or benefit from participation. After this initial process was completed, the names and phone numbers of interested individuals were forwarded to the writer who handled all further contacts.

Regardless of the source of subjects, involvement in this treatment program was always coordinated with the primary care physician of each individual. At no time were subjects asked to change their medication regimens by the principal investigator. Any changes in medication made

during the period of this study were solely the result of patient-doctor consultations and it was assumed that such changes (e.g., increases or decreases) would be indicative of the physician's judgement of either worsening or improving symptomatology.

Pretreatment Ratings. Subjects who participated in this investigation were assessed on the following variables before the first treatment session:

a) Asthma Type: Subjects were assigned to an asthma type category by their physicians according to the following criteria as suggested by Scadding (1976). This information was conveyed to the writer via the completed Asthma Type Form (see Appendix L).

1) Intrinsic-nonreaction to an antigen skin test; no known relationship between external agents and asthmatic symptoms (with the exception of aspirin sensitivity);

2) Extrinsic - positive (i.e., wheal and flare) reaction to an antigen skin test; in absence of such a reaction, a demonstrated relationship between external agents and asthmatic symptoms; family history of asthma or other atopic disorders such as hay fever, rhinitis and eczema;

3) Other - this category was to include either mixed or exercise-induced asthmatics. Mixed asthmatics were defined as those who possessed both intrinsic and extrinsic traits. Exercise-induced asthma is self explanatory.

B) Severity: Subjects were rated as either severe or nonsevere according to the following criteria:

1) Severe - rating of at least level 4 (i.e., "Requires steroids, most, not all of the time") on the Physician's Severity Rating

Scale (Plutchik et al., 1978; see Appendix D);

2) Nonsevere - Physician's Severity Rating of 3 or less.

C) Panic-Fear Type: As reported previously, panic-fear type is determined by two variables - i.e., Symptom Vigilance (as measured by the Asthma Symptom Checklist; see Appendix A) and Personality (as measured by the 20 P-F; see Appendix B). All subjects in the current investigation were categorized according to panic fear type based upon their scores on these two instruments. The reader will recall that Kinsman and his associates (1980a) have identified 9 panic-fear personality subtypes based upon various combinations of symptom vigilance and personality scores, respectively (e.g., Low-Low, Low-Moderate, Low-High, etc.). The cutoff scores for the symptom vigilance categories are defined according to the mean score on the panic-fear items of the ASC and are as follows:

1) Low - mean score of less than 2.43;

2) Moderate - mean score of greater than or equal to 2.43 or less than or equal to 3.29;

3) High - mean score greater than 3.29.

The cutoff scores on the personality variable are determined by the raw score achieved on the 20 P-F and are as follows:

1) Low - raw score less than or equal to 2;

2) Moderate - raw score between the range of 3 and 8;

3) High - raw score equal to or greater than 9.

A description of and psychometric information regarding the ASC and the 20 P-F is provided in the "Dependent Measures" section of this paper.

Number. Attempts were made to recruit 40 subjects for this investigation. An initial list of over 50 names of potential participants was

obtained from the above sources. Of this total, 50 individuals were contacted and 40 agreed to participate in this program. Of this 40, only 28 attended the pretreatment assessment session and further attrition at various points in the study resulted in a final sample of 15 participants who completed the entire 10-week program.

Description of Final Sample. The final sample was composed of 12 females and 3 males who ranged in age from 15 to 61 years old (M=32.33; S.D.=11.17). Three of the participants were Black and the remaining 12 were White (Note: Variables such as age and sex have been investigated elsewhere and have been reported to be unrelated to treatment outcome; Knapp and Wells, 1978).

All the subjects who participated were either extrinsic asthmatics (13) or mixed asthmatics with extrinsic factors being dominant (2). Ten of the subjects were rated as nonsevere and five as severe according to pretreatment PSRS ratings (M=3.33, S.D.=1.40). All subjects were being treated with varying types of medication for their asthma; these included: bronchodilators (e.g., Theodur Proventil); antihistamines (e.g., Dimetane, Fedahest); and corticosteroids (e.g., Prednisone). On the FEV_1/FVC pulmonary function measure (which is commonly used to assess severity in terms of pulmonary demise), pretreatment performance ranged from a low of 61.33% to a high of 98.67% (M=85.78%, S.D.=9.58). Only one subject was categorized as being below normal limits according to the guidelines of the Intermountain Thoracic Society (i.e., below 69% is considered to be subnormal; Cooper, 1982). Given these figures it would seem safe to describe this sample as episodic as opposed to chronic asthmatics since, by definition, episodic asthmatics may perform within normal limits between asthma attacks whereas chronic asthmatics

usually exhibit consistently subnormal performance.

According to panic-fear personality subtypes, the sample was divided as follows: 1 subject in the Low-Moderate category; 7 subjects in the Moderate-Moderate category; 2 subjects in the Moderate-High category; 1 subject in the High-High category. The reader will recall that Kinsman et al. (1980a) would recommend relaxation therapy only for these latter 3 subjects.

Dependent Measures

Self-Report. Three self-report instruments were used in this study: the ASC (Appendix A); the 20 P-F (Appendix B); and the Daily Assessment Form (Appendix E). The first two of these measures (i.e., the ASC and the 20 P-F)were also used for the purpose of pretreatment assessment.

1) Asthma Symptom Checklist - the ASC is a 50 item questionnaire which measures the following illness-specific factors associated with asthma: 1) Panic-Fear; 2) Irritability; 3) Fatigue; 4) Hyperventilation-Hypocapnia; 5) Airway obstruction. Each item on the checklist is a symptom commonly associated with asthma (e.g., short of breath, afraid of dying) and the subject is asked to report the degree to which each symptom affects him or her on a five-point scale ranging from "never (1)" to "always (5)." As mentioned previously, the ASC is thought to be a measure of symptom vigilance; i.e., the degree to which the patient pays attention to/is aware of his/her symptoms. Of the five factors listed above, the Panic-Fear factor is of primary interest in the current study. The ASC categorizes asthmatics into Low, Moderate, and High categories, with Low scores being considered least adaptive.

The ASC is a highly reliable instrument with coefficients of test-

retest stability (after a two week interval) ranging from .76 (Fatigue) to .95 (Panic-Fear) (Kinsman et al., 1973). Its validity is supported by its consistent ability to predict variables such as: usage of as-needed (PRN) medications; intensity of discharge medication; and probability of re-hospitalization in an exhaustive series of studies over the past decade. The reader is referred to Kinsman et al. (1973), Kinsman et al. (1974), and Jones et al. (1979) for a more complete discussion of the development of the ASC as well as its psychometric properties.

2) 20 P-F: The 20 P-F is a twenty item, true-false scale consisting of items from the Minnesota Multiphasic Personality Inventory (MMPI) designed to measure a personality variable called PANIC-FEAR. The scale was developed by Dirks et al. (1977b; 1978) and its items were chosen because of their ability to correctly assign asthmatic patients to Low, Moderate, and High Panic-Fear categories as previously measured by the Asthma Symptom Checklist (Kinsman et al., 1973). Fifteen of the 20 items are actually utilized in assessing Panic-Fear Personality while the remaining five items are fillers. Like the ASC, the 20 P-F also differentiates subjects in terms of Low, Moderate, and High categories of Panic-Fear (with Low and High considered maladaptive). Unlike the ASC, which is said to be a measure of illness-specific symptom vigilance, the 20 P-F measures a trait or more characterological form of anxiety (Dirks et al., 1977c; Jones et al., 1979; Kinsman et al., 1980a).

The 20 P-F appears to be a very reliable and stable measure. Dirks et al. (1978a) reported a test-retest reliability of .79 after an interval of several months. More recent studies (Kinsman et al., 1980) have reported similar stability following intervals of up to two years.

In terms of validity, the 20 P-F has been found to correlate .83 with the Taylor Manifest Anxiety Scale, a scale used to assess Trait Anxiety (Kinsman et al., 1980c). In addition, the 20 P-F, both alone and in conjunction with the ASC, has consistently been shown to predict such important variables as: intensity of discharge medication; length of hospital stay; and probability of re-hospitalization in an impressive series of studies over the past five years. For further information regarding the development and psychometric properties of the 20 P-F, the reader is referred to Jones et al. (1979), and Kinsman et al. (1980).

3) Daily Assessment Form: The DAF is a self-report questionnaire developed for use in the current investigation. The DAF was utilized to collect the following information: number of attacks per day; duration of each attack; intensity rating (1:mild - 10:severe) of each attack; amount and type of medications ingested each day. For the purpose of this study, an attack was defined minimally as the initial onset of the following symptoms: wheezing, tightening of the chest, and dyspnea. The DAF was completed by patients on a daily basis throughout the entire course of this study.

Pulmonary Function. Five separate measures of pulmonary function were used to assess the impact of treatment. Four of these measures are commonly used as outcome variables in asthma treatment studies. These measures included: Peak Expiratory Flow Rate (PEFR); Forced Vital Capacity (FVC); Forced Expiratory Volume in one second (FEV_1); and the ratio of FEV_1/FVC. A fifth measure, Maximal Mid-Expiratory Flow Rate (MMEFR) was added for experimental control purposes. A brief description of each of these measures is provided below. More

extensive reviews can be found elsewhere (Cherniack, 1977; Ruppel, 1979).

A) PEFR is a measure of the individual's maximum rate of expiration following a full inspiration. PEFR is recorded in liters of air per unit of time (usually liters per second or minute). PEFR is a rather crude measure of pulmonary function in that it tends to be variable and somewhat effort-dependent.

B) FVC is essentially an estimate of lung capacity. It is a measure of the maximum volume of expiration following a full inspiration. FVC only estimates total lung capacity in that a certain amount of air always remains in the lungs following even the most complete expiration. FVC is a measure of the overall flow-resistant properties of the lungs and air passages and is generally reported in liters.

C) FEV_1 is a measure of the amount of air (in liters) forcibly exhaled in one second following a full inspiration. Whereas nonasthmatic individuals generally expire between 75%-85% of inspired air within the first second of expiration, asthmatics expire a lower percentage as a function of impaired breathing passages.

D) FEV_1/FVC is the percentage of the FVC expired in the first second of expiration following a full inspiration. Nonasthmatics generally expire greater than 75% of FVC in the first second of expiration. An FEV_1/FVC of less than 69% is generally considered to be subnormal. When FEV_1/FVC drops to 20% or below, hospitalization is usually required.

E) MMEFR is a measure of the average rate of expiration during the "middle-half" of a full inspiration. MMEFR is reported in liters per second or minute. This measure is being added to the "standard battery" because it tends to be less susceptible to subjective variables such as motivation than some of the other measures (e.g., PEFR, FEV_1).

A major advantage of using the entire "battery" described above is that predictive nomograms have been established for each of these values (with the exception of PEFR), based upon the age, height, and sex of the individual asthma patient (Morris, Koski and Johnson, 1971)[1]. Use of these nomograms enables the investigator to estimate the degree of pulmonary demise as a function of asthma. In addition, it enables one to better estimate the clinical significance of any change which results from treatment (i.e., post-treatment values which closely approximate the predicted normal values for a given asthmatic can be viewed as clinically significant).

Physician Ratings. Like the 20 P-F and the ASC, the Physician's Severity Rating Scale (PSRS, see Appendix D) also served the dual function of a pretreatment assessment device and a dependent measure. As a dependent measure, the PSRS was utilized as an independent assessment of patient functioning based upon their current level of medication requirements. The PSRS is a nine point scale ranging from (1) "Mild" to (9) "Constantly disabled." It was developed by Plutchik et al. (1978) "to provide an overall index of asthma severity in terms of the dependence of the patient on medication" (p. 426)." The PSRS was completed by the primary care physician (or nurse) of each patient involved in this investigation.

Additional Measures

Two additional measures were employed for differing purposes in this investigation. One measure, the Asthma Survey Schedule (AmSS; Cautela, 1981; see Appendix C) was included for the purpose of information gathering. The AmSS is a 39-item questionnaire which asks patients to provide a wide range of information such as: age, height, medication (dosage and type), allergies, typical symptoms, and particular times of year the patient may consider to be especially troublesome. The AmSS was employed primarily because it provided the investigator with information which was helpful in evaluating other assessment variables (e.g., time of year information was useful when examining data regarding outcome on the frequency of attacks variable). This form was completed at pre-treatment only.

A final measure, the 24 Hour History (Appendix F) was used to assess and control for variables which could potentially confound the above measures of pulmonary function (e.g., stimulants such as caffeine might result in a temporary improvement). The 24 History is an 11-item questionnaire adapted for use in this investigation. It asks questions such as: How many hours since your last meal? Beverage? This questionnaire was completed by subjects prior to each pulmonary assessment session.

Apparatus

A Collins 13.5 liter water-seal spirometer was used to assess all measures of pulmonary function with the exception of PEFR. The spirometer features a bell-counterweight pulley system, recording pens and a variable speed kymograph. The Collins spirometer and its features are described more fully elsewhere (Ruppel, 1979). A Wright Peak Flow

Meter (Wright, 1959) was used to measure this final pulmonary function variable (i.e., PEFR).

Procedure

Initial Contact. Persons expressing an interest in participating in this investigation were contacted directly by the principle investigator. At this time the general purpose and requirements of participation in the study were explained (see the Informed Consent in Appendix H for the content of this discussion). In addition, any questions which individuals had at this time were answered. Finally, an appointment was made for the pretreatment assessment.

Pretreatment Assessment. Several events took place at the pretreatment session. First, subjects were given a copy of the Informed Consent Form to read. After all questions were answered to the satisfaction of the individual, he/she was asked to sign the form. Next, subjects were asked to complete: 1) The Asthma Symptom Checklist; 2) the 20 P-F; and 3) The 24-Hour History. Subjects then completed the initial pulmonary function session at this time (the procedures of this will be described in the "Spirometry" section).

Upon completion of the above tasks, an appointment was made for the initial relaxation training session. Whenever possible, this initial session was arranged to be at least 7 days following the pretreatment assessment session. During this 7 day period, subjects were asked to begin collecting baseline data on the DAF (Appendix F). In addition, they were asked to complete the AmSS (Appendix C) and bring it to their first treatment session. Finally, a copy of the PSRS (Appendix D) was sent to each patient's physician for completion.

Treatment. All treatment sessions were conducted by the principal

investigator who had completed 3 years of graduate training in the Clinical Psychology Program at Virginia Commonwealth University (VCU). Each session was held at the Psychological Services Center (PSC) at VCU. The PSC is an out-patient clinic operated by the Clinical Psychology Program which offers general outpatient mental health services to residents of the greater Richmond area. All treatment sessions were conducted in a group format with a minimum of two persons in addition to the investigator present at all sessions. Decisions as to which subjects would attend which sessions were made solely on the basis of convenience for the patients (i.e., membership was not determined according to asthma severity or panic-fear type). Initially, subjects were given the choice of signing up for 1 of 4 class times. It was hoped that they would attend each class on a regular basis, however, it became necessary to allow certain subjects to rotate their meeting times from week to week because of varying schedules and commitments. As a result, only 3 individuals out of 15 attended all sessions at the same time each week. Treatment consisted of a total of five weekly sessions with each session lasting between 60 and 90 minutes. The therapist was blind to the asthma type, severity, and panic-fear type of participants until the completion of the treatment period.

Components of the relaxation training employed in this investigation included: Progressive Muscle Relaxation (Jacobson, 1938; Wolpe and Lazarus, 1966); Cue-Controlled Relaxation (Russell and Sipich, 1973): and Positive Imaging (Shoemaker, 1979). A complete description of these procedures can be found elsewhere (Rimm and Masters, 1979).

At the initial session, the general process of progressive

relaxation was described to the subjects and each subject was provided with a manual which describes each component of the training program (see Appendix I). This manual is designed to facilitate the acquisition of the relaxation techniques in that it enabled subjects to practice these skills on their own. A synopsis of each component is provided below.

Progressive muscle relaxation "involves the successive tensing and relaxing of voluntary muscles in an orderly sequence until all the main muscle groups of the body are relaxed (Rimm and Masters, 1979, p. 35)." Examples of muscle groups which are typically focused upon include: hands, arms, neck, and lower extremities. Subjects were asked to report in the first session any particular muscle group which may prove problematic for them (e.g., as the result of a previous injury). If there were such problem areas, subjects were instructed to skip any exercises which proved aggravating. In addition, subjects were urged to report any physical discomfort which they experienced in the course of relaxation training. Once again, specific exercises which seemed to cause discomfort were eliminated from their particular program.

Positive imaging (Shoemaker, 1979) is an exercise which was devised to aid in the relaxation of the eyes and forehead area. It simply involves having each subject imagine a scene which he or she finds to be particularly relaxing. Examples of such pleasant images typically include: mountain lakes; the seashore; and involvement in relaxing activities such as golf or swimming. This exercise was employed at the completion of the muscle-tense-relax sequence.

The final relaxation component utilized in the current training

program was cue-controlled relaxation (Russell and Sipich, 1973). Cue-controlled relaxation was employed for two reasons: 1) to help the individual become even more deeply relaxed following the completion of more traditional relaxation exercises; 2) to teach the client a method of relaxing in a very brief period of time when running through an entire progressive muscle relaxation sequence might be impractical (e.g., at the office). The process involves having each individual pay close attention to his/her breathing and to recite a word such as "calm" or "relax" to themselves each time they exhale. It is felt that the combination of rhythmic breathing with self-instruction to relax or be calm contributes significantly to the overall ability of the individual to relax.

Once subjects were taught all the steps of this procedure, they were instructed to employ their relaxation skills, particularly cue-controlled relaxation, as active coping mechanisms in the face of day to day stressful situations. Particular emphasis was made on the utilization of relaxation skills when faced with the initial cues of an oncoming asthma attack (e.g., chest tightening, dyspnea; slight wheeze) (cf. Sirota and Mahoney, 1974).

As a check on the degree to which subjects in each group acquired the relaxation skill, subjects were asked to rate themselves on a "relaxation thermometer" (Alexander et al., 1972) at the beginning and end of each session. The "relaxation thermometer" (see Appendix J) is a 10 point rating scale ranging from 1 (very relaxed) to 10 (extremely tense). It was expected that acquisition of the relaxation skill would result in decreased ratings at post-session as compared to pre-session.

In an effort to facilitate the acquisition of the relaxation techniques, subjects were instructed to practice their relaxation skills on a daily basis for approximately 30 minutes. As a partial check on the degree to which subjects in each group complied with these instructions, they were asked to keep a daily log of their practice time (see Appendix K).

Following the fifth and final training session, an appointment was made with each subject for a post-treatment assessment session. In all cases, this appointment was scheduled within one week of the final treatment session. In addition, subjects were asked to: 1) continue completing the DAF daily; 2) continue practicing relaxation skills daily as well as keep an ongoing log of their practice. Finally, a copy of the PSRS was sent to each patient's physician for completion.

Post-treatment/Follow-up Assessments. Except for completing the Informed Consent Form and the Asthma Survey Schedule, the procedures at these two sessions followed exactly the same format as those described in the "Pretreatment Assessment" section. As stated, all post-treatment sessions were arranged within one-week of the final relaxation therapy session. All follow-up sessions, with one exception, were scheduled at least 4 weeks after the post-treatment sessions. The one exception involved a subject who was to be out of town for two weeks beginning in what would have been her fourth week following post-treatment. Rather than lose these data, an appointment was made for this individual three weeks following post-treatment. After the follow-up session, subjects were thanked for their participation in the project and encouraged to continue using their relaxation training as they deemed appropriate.

Spirometry. With the exception of one session at the pretreatment

assessment, pulmonary function sessions for all subjects were conducted by a second-year graduate student in the Clinical Psychology Program at Virginia Commonwealth University. The procedure was designed in this manner in order that the principal investigator would remain blind to the outcomes of these assessments. This condition was met in all but the one case noted (i.e., the principal investigator had to fill in due to a scheduling problem). The second-year student and the principal investigator (i.e., for back-up purposes) were trained and supervised in the conducting of pulmonary assessments by an Assistant Professor in the Department of Health and Physical Education at the same university. The second-year student was blind to the hypotheses of this investigation in an attempt to minimize the potential for experimenter bias.

All sessions were conducted in the Psychophysiology Laboratory of the Clinical Psychology Program. All assessments for any given subject were to be performed at the same time of day (plus or minus an hour) in an attempt to hold any potential circadian cycle effects constant. This condition was met in most cases, however, three post-treatment sessions were held approximately 1 1/2 hours earlier than the respective pretreatment time.

Prior to each assessment session, the second-year student completed the following tasks: First, the spirometer was checked in order to ensure that it was working properly. Next, the time, temperature of the spirometer, and the barometric pressure were recorded. The temperature and barometric pressure were needed to convert obtained results from Ambient Temperature Pressure Saturated (ATPS) to Body Temperature Pressure Saturated (BTPS) (i.e., these conversions are necessary in order to approximate "true" lung volumes; Gaensler and Wright, 1966). Finally, the peak-flow meter was cleaned (i.e., with a germicidal product)

and prepared for usage.

Subjects were asked to refrain from ingesting the following items for at least 3 hours prior to each assessment: foods, liquids (with the exception of water and juices); cigarettes. A 24-Hour History (Appendix F) was completed before each session in order to monitor such intake. With a few minor exceptions this post-absorption requirement was met satisfactorily. Efforts were made to schedule assessment times so that this post-absorption requirement would not present a major inconvenience to the subjects.

Subjects were asked to sit quietly and complete the 24-Hour History while the pulmonary examiner was preparing the equipment. This procedure generally required 10-15 minutes and was intended to allow subjects time to adapt to the surroundings of the Psychophysiology Laboratory before the actual assessment. Prior to the initial session, the pulmonary function maneuver was explained to each subject and each was provided with a written description of the procedure (see Appendix G). The pulmonary function maneuver is a simple procedure which requires the individual to exhale as much air as possible from his/her lungs, as rapidly as possible, following a deep inspiration of air. Four of the pulmonary function measures (i.e., FEV_1;FVC; FEV_1/FVC; MMEFR) were based upon this one maneuver, whereas, the fifth measure (PEFR) required a similar rapid exhalation on the Peak-flow meter. Prior to the pretreatment assessment, subjects were allowed to practice the procedure until (in the judgement of the examiner) they were familiar with the process. This was done primarily to eliminate learning effects (i.e., persons perform at higher levels once they are familiar with the maneuver). At the post-

treatment and follow-up session, subjects were given only one such practice trial. During each session, three maneuvers on both the spirometer and the peak-flow meter were performed and the results of these trials were averaged. Subjects were encouraged to give maximum effort on all trials. The entire process, including the 15 minute adaptation period, required approximately 30 minutes.

Each subject was required to participate in 3 separate pulmonary assessment sessions in the current investigation. As indicated previously: the pretreatment session was scheduled approximately one week prior to the first relaxation session; the post-treatment session was scheduled within one week of the final relaxation session; and the follow-up session was scheduled at least 4 weeks (with the one exception noted earlier) following the post-treatment assessment.

Data Collection. In order to minimize the effects of experimenter bias, the principal investigator remained blind to the performance of specific individuals on all the dependent measures throughout the investigation. This was accomplished in two ways. First, as indicated, all pulmonary function sessions (with one exception) were performed by a research assistant who was blind to the hypotheses of the investigation. Data collected by this individual were identified by code numbers before being given to the principal investigator. Similarly, any questionnaire/self-report data collected by the principal investigator was identified by code number and stored until it was to be evaluated. This coding served the dual purpose of protecting the confidentiality of participants as well as encouraging more accurate (i.e., less socially desirable) completion of data forms. The reader is referred to Figure 1 for a pictoral summary of the assessment schedule followed

for this entire investigation.

Table 1

Summary of Assessment Schedule

	Pretreatment/ Baseline	Relaxation Training					Post-Treatment	Follow-Up
Measures / Week	1	2	3	4	5	6	7	10
Asthma Survey Schedule*	X	-	-	-	-	-	-	-
Asthma Symptom Checklist*	X	-	-	-	-	-	X	X
20 P-F (Panic-Fear Personality)	X	-	-	-	-	-	X	X
Physician's Severity Rating	X	-	-	-	-	-	X	X
Daily Assessment Form ■	X	X	X	X	X	X		X
Pulmonary Function Battery	X	-	-	-	-	-	X	X
Relaxation Thermometer	-	X	X	X	X	X	-	-
24 Hour History ⊛	X	-	-	-	-	-	X	X
Practice Log ▲	-	X	X	X	X	X	X	X

Notes

* Used only in Subject Selection Process

⊛ Used prior to each Pulmonary Function Battery for control purposes

■ Given on a daily basis throughout the entire course of the investigation

▲ Completed on a daily basis after treatment begins

Symbols

X = Assessment Completed

- = Assessment Omitted

Results

Of the 15 subjects who participated in the entire 10 week treatment and evaluation process, complete data on all measures were availabe for only 13 subjects. One subject apparently did not fully understand the assignment to record the number attacks she experienced in a given day. This problem was not detected and rectified until the second week of self-monitoring and as a result the baseline information regarding number of asthma attacks per week was lost. A second subject was to have completed and mailed her final self-report forms during the follow-up period. Unfortunately this information was never received by the investigator. As a result of the above difficulties, the number of subjects involved in each statistical analysis varied from 13 to 15 depending upon the variable under study.

Treatment Efficacy

The analyses in this section were conducted to determine whether relaxation training resulted in a significant improvement for all subjects regardless of asthma type, severity, duration of the illness, or Panic-Fear personality type. Change in status was evaluated from pretreatment to posttreatment and post-treatment to follow-up for all dependent measures. The primary statistical analysis employed in this section was a Planned Comparison T-Test. The results of these analyses are summarized in Table 2.

Acquisition of the Relaxation Skill. Before and after each of the 5 relaxation sessions, subjects rated themselves on the Relaxation Thermometer (RT; see Appendix J) which is a scale ranging from 1 (very relaxed) to 10 (extremely tense). Comparison of pre- and post-session ratings indicated that self-ratings of tension decreased significantly in all 5 treat-

Table 2

Summary of Means and Planned Comparisons for all Dependent Measures

Variable	n	df	Pretreatment Mean	Pretreatment S.D.	Posttreatment Mean	Posttreatment S.D.	Follow-up Mean	Follow-up S.D.	Planned Comparisons[1] Pre to Post t-value	Planned Comparisons[1] Post to Fol.Up t-value
Relaxation Therometer										
Session 1	15	14	6.07	2.02	3.00	1.41	-	-	-6.95****	-
Session 2	15	14	5.87	2.07	2.60	1.50	-	-	-5.70****	-
Session 3	15	14	6.47	1.81	2.80	1.47	-	-	-8.07****	-
Session 4	15	14	5.40	2.03	2.60	1.84	-	-	-6.92****	-
Session 5	15	14	6.53	1.68	3.07	1.90	-	-	-6.61****	-
Frequency of Attacks	13	12	5.46	4.31	3.15	3.80	4.84	3.89	-2.01*	2.19
Physician Ratings (PSRS)	15	14	3.33	1.40	2.47	1.30	2.33	1.18	-2.83**	-1.00
Peak Flow	15	14	429.51	110.87	440.78	92.57	453.97	85.67	.66	1.15
Forced Expiratory Volume (FEV_1)	15	14	2.66	1.04	2.69	.94	2.77	.90	.29	.96
Forced Vital Capacity (FVC)	15	14	3.13	1.23	3.12	1.15	3.35	1.18	-.09	2.51*
FEV_1/FVC	15	14	85.78	9.58	87.24	7.77	83.93	9.19	.76	-4.87
Maximal Midexpiratory Flow Rate (MMEFR)	15	14	3.64	2.38	3.67	2.33	3.21	1.32	.14	-1.33
Symptom Vigilance (ASC)	14	13	3.29	.75	2.72	.93	2.64	.84	-2.67**	-.47
Panic-Fear Personality (20 P-F)	14	13	6.79	2.75	6.50	2.90	6.21	2.45	-.67	-.67

[1] Note. One-Tailed t-tests

*$p < .05$

**$p < .01$

***$p < .001$

****$p < .0001$

ment sessions ($t(14)=-6.95$, $p < .0001$; $t(14)=-5.70$, $p < .0001$; $t(14)=-8.70$, $p < .0001$; $t(14)=-6.92$, $p < .0001$; $t(14)=-6.61$, $p < .0001$; respectively). These results suggest that the subjects involved in this investigation acquired the relaxation skill sufficiently within the treatment sessions themselves.

Frequency of Attacks. Throughout the study subjects recorded the number of attacks they experienced on a daily basis and the frequency of these attacks during pretreatment, post-treatment, and follow-up periods was analyzed for change in response to treatment. Pretreatment baseline consisted of the number of attacks experienced by each subject the week prior to their first relaxation session. In most cases, this involved a 7-day period; however, because of scheduling difficulties, in some cases a full seven days did not transpire between the pretreatment assessment session and the first relaxation session (e.g., in 4 cases only 6 days transpired; in 1 case, 4 days transpired). For these subjects, the number of attacks recorded prior to treatment was prorated for seven days. The post-treatment period consisted of the 7 days immediately following the final treatment session for each subject. The follow-up period involved the 7 day period immediately preceding the final pulmonary assessment session. Prorating was not necessary for either the post-treatment or follow-up periods.

Comparisons of the mean number of attacks per week indicated a significant decrease for the interval between pretreatment and post-treatment ($t(12)=-2.01$, $p < .05$). Contrary to expectations, a two-tailed T-Test revealed a significant increase in the number of attacks experienced between the post-treatment and follow-up periods ($t(12)=2.19$, $p < .05$). These results suggest that while improvements on this variable were

achieved as a result of treatment, they were not maintained through the follow-up period. It is important to note that although subjects "relapsed" during the follow-up period, they apparently were no worse off then when treatment began (i.e., pretreatment $\underline{M}$=5.46, S.D.=4.31; follow-up $\underline{M}$=4.85, S.D.=3.89). These results are shown in Figure 1.

Physician Ratings/Medication Usage. All subjects were rated by their physician at the pretreatment, posttreatment and follow-up periods. These ratings were based upon the type and level of medication which the subject was currently using and determined the severity of each individual's asthma. Ratings of 1 (Mild) to 9 (Constantly Disabled) were assigned using the PSRS with lower numbers being associated with less intensive medication requirements for the control of asthmatic symptoms.

A Planned Comparison T-Test was used to assess whether involvement in the treatment program resulted in decreased severity ratings. A significant decrease in these ratings was found when the post-treatment ratings were compared with the pre-treatment ratings ($\underline{t}(14)=-2.83$, $\underline{p} < .01$). A further decrease was observed between post-treatment and follow-up, however, this decrease was not statistically significant. These results (shown in Figure 2) suggest that in the opinion of their respective physician's, subjects required less intensive doses and types of medications for control of asthmatic symptoms at post-treatment and follow-up than at pretreatment. In addition, their asthma was seen as being less severe at the conclusion of this treatment program than at the outset at least according to this criterion.

In addition to the physician ratings, subjects were required to monitor their medication intake on a daily basis throughout the course of this investigation. Unlike the physician ratings, these data were not analyzed as a dependent variable because the wide variety of medi-

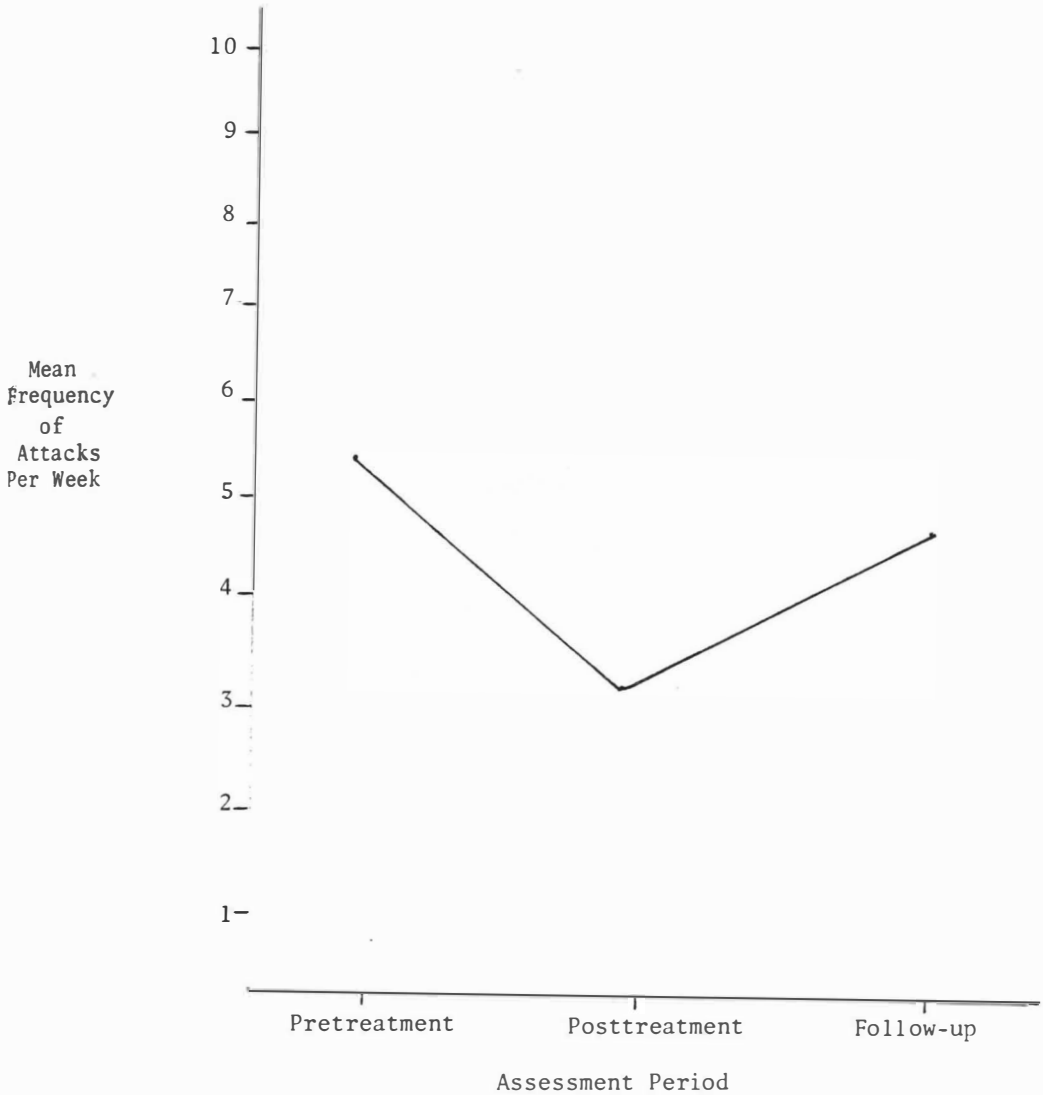


Figure 1. Frequency of asthma attacks experienced during pretreatment, posttreatment, and follow-up periods.

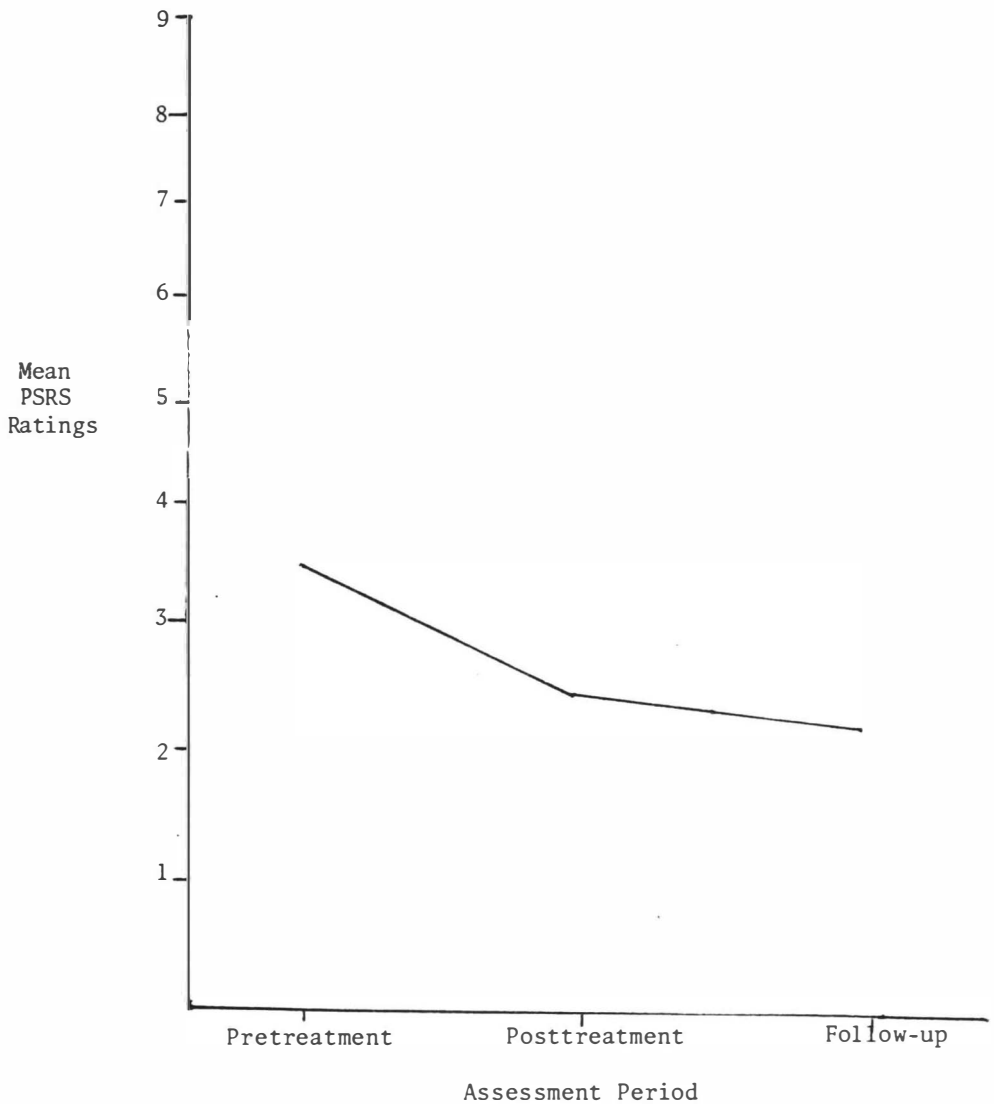


Figure 2. Physician's Severity Ratings (PSRS) at pretreatment, posttreatment, and follow-up assessment.

cation types and dosages used by subjects made statistical analysis impractical. Instead, they were used to determine whether subjects increased, decreased, or maintained similar medication patterns throughout the study. The primary focus was upon whether or not medication use increased during pretreatment, post-treatment and follow-up periods. It was reasoned that improvements made on other dependent measures could be more unambiguously attributable to the relaxation therapy if medication levels either decreased or stayed the same during these comparison periods. Such an inference could not be made if improvement was associated with increased levels of medication.

Decisions as to whether a given subject's medication level had changed were made in the following manner. Medications ingested by each subject during week one were recorded and were used as a pretreatment baseline level. This baseline level was then compared with the levels recorded in week 6 (post-treatment) and week 10 (follow-up) respectively and an overall rating was assigned to each patient according to the following criteria: A rating of "increase" was assigned if: a) a particular dosage was increased; b) a new medication was added without discontinuation or decreasing other medications; c) usage of inhalers (i.e., number of sprays per day) increased. A "decrease" rating was assigned if: a) dosage level decreased; b) a medication was discontinued; c) use of inhalers decreased. A rating of "same" was given when medication usage patterns remained identical for each of the comparison weeks.

On the basis of this procedure the following results were obtained. At week 6: 2 subjects had increased medication intake; 3 had decreased; 9 had remained the same. At week 10; 2 subjects were rated as increased, 7 decreased, and 5 remained the same. These results are consistent with

the findings for the physician's ratings. It is also worth noting that during the course of the study: 1 subject discontinued medication usage altogether (week 6); 1 subject discontinued use of prednisone (week 7); and 2 subjects decreased prednisone usage significantly (e.g., one subject was able to cut dosage in half over a 6 week period); only 1 subject increased prednisone usage and that was only for a 4 day period during week number 9.

These findings, taken together with the PSRS results suggest that medication usage decreased as a function of participation in the treatment program. While these findings seem worthwhile in and of themselves, the intended purpose of being able to evaluate additional dependent measures without the potential confound of medication increases clearly appears to have been met.

Pulmonary Function. Several measures of pulmonary function were employed to evaluate change over the course of this investigation. For each measure used, improvement was indicated by increased values for that particular measure. A Planned Comparison T-Test was used for analysis in all cases (see Table 2).

Three measures of flow-rate were used in this study. On the measure of Peak Expiratory Flow Rate (PEFR), results at post-treatment were not significantly greater than pre-treatment. Increased PEFR values were observed between post-treatment and follow-up, however, this increase did not reach significance. On the measure of Forced Expiratory Volume in one-second (FEV_1), no significant differences were observed at either post-treatment or follow-up. Similar to the PEFR, an increase was observed between post-treatment and follow-up, however, it failed to reach significance. Finally, on the measure of Maximal Mid-Expiratory Flow

Rate (MMEFR), no significant differences were observed in either the pretreatment/posttreatment or posttreatment/follow-up comparisons. The above results indicate that flow-rate of breathing was not significantly effected by relaxation training.

One measure of lung volume was used in this investigation (Forced Vital Capacity; FVC). On this measure no significant difference was found between the pretreatment and post-treatment assessments, however, a significant increase was observed between the post-treatment and follow-up periods ($t(14)=2.51$, $p < .05$). This result (see Figure 3) suggests that relaxation training may be significantly related to improvement in usable lung capacity and efficiency (i.e., due to improved elasticity). It appears, however, that this effect did not occur until after the formal treatment sessions had terminated which suggests that this benefit of relaxation therapy may be achieved on a delayed basis.

FEV_1/FVC was used to evaluate the percentage of air exhaled within the first second of a forced expiration. As noted previously, FEV_1/FVC is commonly employed to assess pulmonary demise/improvement in asthmatics. A nonsignificant increase on this measure was observed between pretreatment and posttreatment. Contrary to expectations, a two-tailed T-Test revealed a significant decrease between post-treatment and follow-up ($t(14)=-4.87$, $p < .001$). As indicated in Figure 4, it appears that subjects received some initial benefit from the treatment strategy before returning to essentially pre-treatment performance levels (pretreatment $M=85.78\%$, S.D.=9.58; post-treatment $M=87.24\%$, S.D.=7.77; Follow-up $M=83.93\%$, S.D.=9.19).

Percent-predicted values for 4 of the above measures (i.e., FEV_1; FVC; FEV_1/FVC; MMEFR) were calculated to assess the degree to which

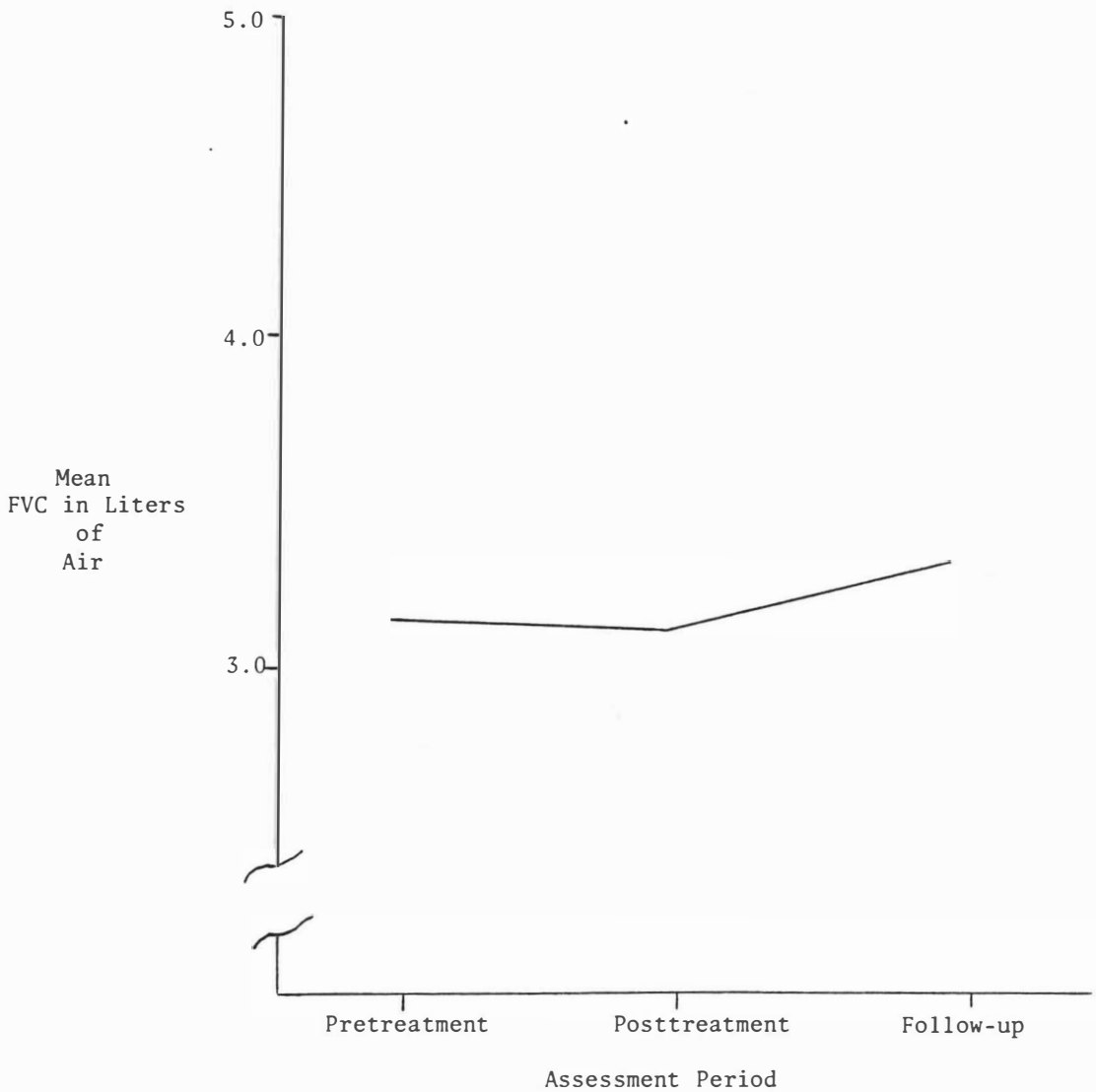


Figure 3. Forced Vital Capacity (FVC) performance at pretreatment, posttreatment, and follow-up assessment.

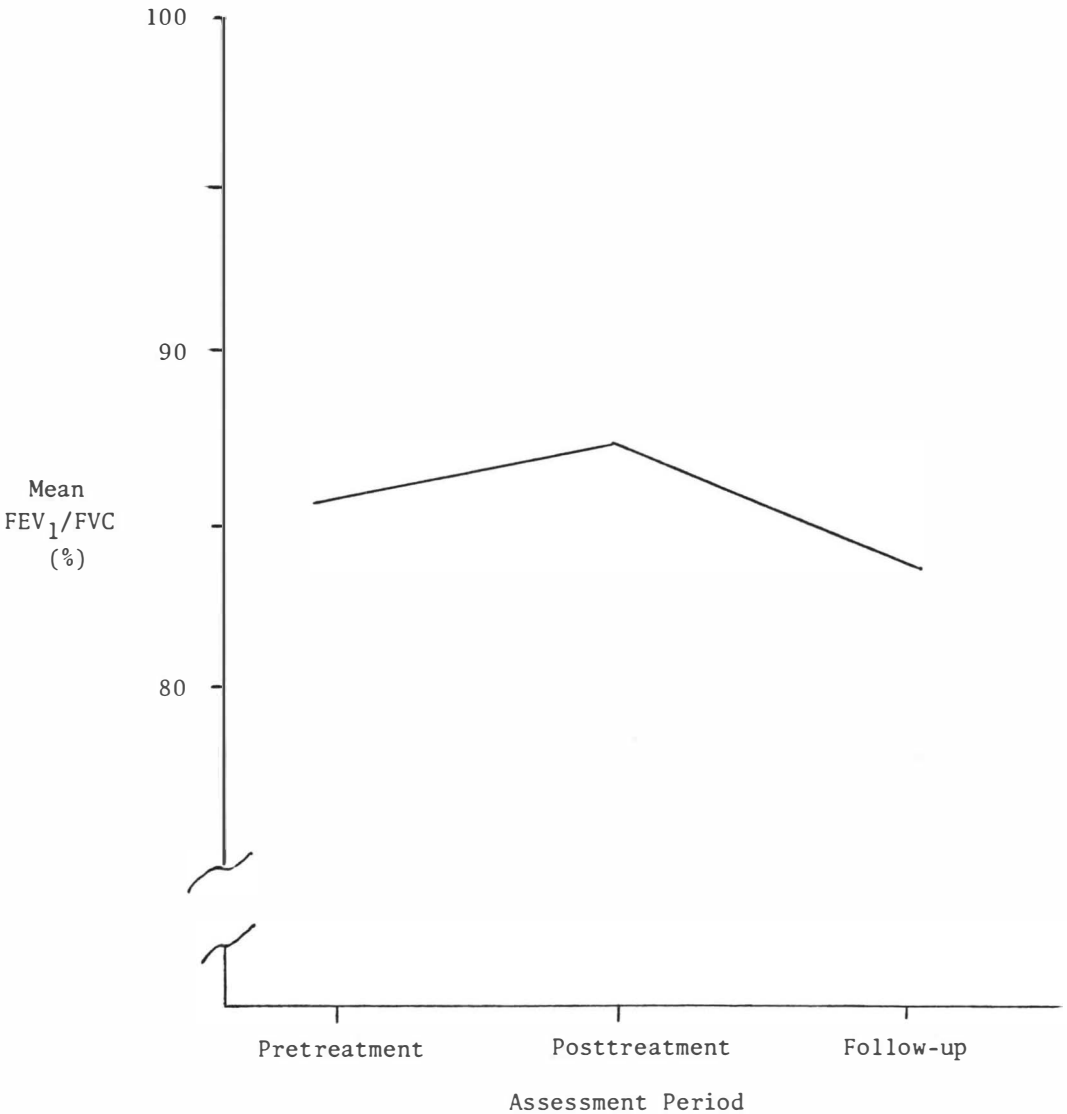


Figure 4. FEV_1/FVC performance at pretreatment, posttreatment, and follow-up assessment.

subjects changed as a result of treatment when compared to normative standards established for persons of similar age, height, and sex. The use of such comparisons is helpful in determining the clinical significance of improvements on these pulmonary measures. The means and standard deviations of these percent-predicted values are summarized in Table 3.

On the two measures of flow-rate (i.e., FEV_1; MMEFR), only minimal improvements were made. For example, the mean performance on the FEV_1 measure increased only 1% between pretreatment and post-treatment and an additional 2.8% between post-treatment and follow-up (pretreatment M=83.10, S.D.=19.84; post-treatment M=84.12, S.D.=17.32; follow-up M=86.91, S.D.=13.89). Similarly, the mean performance on the MMEFR measure increased 2.3% between pre-treatment and post-treatment and decreased over 13% between post-treatment and follow-up (pretreatment M =101.45, S.D.=61.96; post-treatment M=103.77, S.D.=62.58; follow-up M =90.29, S.D.=34.55). It should be noted that although performance on the MMEFR variable at follow-up was lower than at pre-treatment, it was nevertheless within normal limits. On the FVC measure, only slightly greater improvement was observed in that an overall increase of 5.4% was achieved (pretreatment M=75.56, S.D.=18.93; post-treatment M=75.60, S.D.=16.56; follow-up M=80.98, S.D.=15.41). Finally, on the FEV_1/FVC measure, results were mixed as a 1.9% improvement at post-treatment was followed by a 7.6% decrease at follow-up (pretreatment M=109.99, S.D.=13.11; post-treatment M=111.87, S.D.=11.04; follow-up M=104.27, S.D.=20.47). Similar to the MMEFR measure, it should be noted that although subjects appear "worse off" at follow-up they were still performing within normal limits. Given that a 15% improvement is generally

Table 3

Mean Values for Percent-Predicted Pulmonary Function Measures

Variable	Assessment Period		
	Pretreatment	Posttreatment	Follow-up
FEV_1			
M	83.10	84.12	86.91
SD	19.84	17.32	13.89
FVC			
M	75.56	75.60	80.98
SD	18.93	16.56	15.41
FEV_1/FVC			
M	109.99	111.87	104.27
SD	13.11	11.04	90.29
MMEFR			
M	101.45	103.77	90.29
SD	61.96	62.58	34.55

considered to be a minimally acceptable level of clinical significance (c.f., Erskine-Millis and Schonell, 1981), these findings indicate that relaxation therapy resulted in only limited improvement in respiratory functioning.

Panic-Fear Variables. Two measures of panic-fear associated with asthma were evaluated. The Asthma Symptom Checklist (ASC) is a measure of symptom vigilance with low scores being associated with a maladaptive tendency to downplay the severity of symptoms and high scores associated with adaptive vigilance. The 20 P-F is a measure of panic-fear personality for which both low and high scores are considered to be maladaptive. A Paired Comparison T-Test was used to evaluate the susceptibility of each of these variables to change in response to relaxation training.

On the measure of symptom vigilance a significant decrease was observed from pretreatment to post-treatment ($t(13) = -2.67$, $p < .01$). A further nonsignificant decrease was observed between post-treatment and follow-up. These results (see Figure 5) suggest that symptom vigilance, as measured by the ASC, is susceptible to change in response to relaxation training and are consistent with the description of symptom vigilance as a "state" measure of anxiety (Dirks et al., 1977). Whether such change should be considered adaptive is a point of discussion which will be addressed later.

On the measure of panic-fear personality, nonsignificant decreases occurred at both the post-treatment and follow-up assessments. These findings are consistent with the suggestion that panic-fear personality is a trait variable which is not readily susceptible to change (Dirks et al., 1977c). They are not, however, consistent with the hypothesis

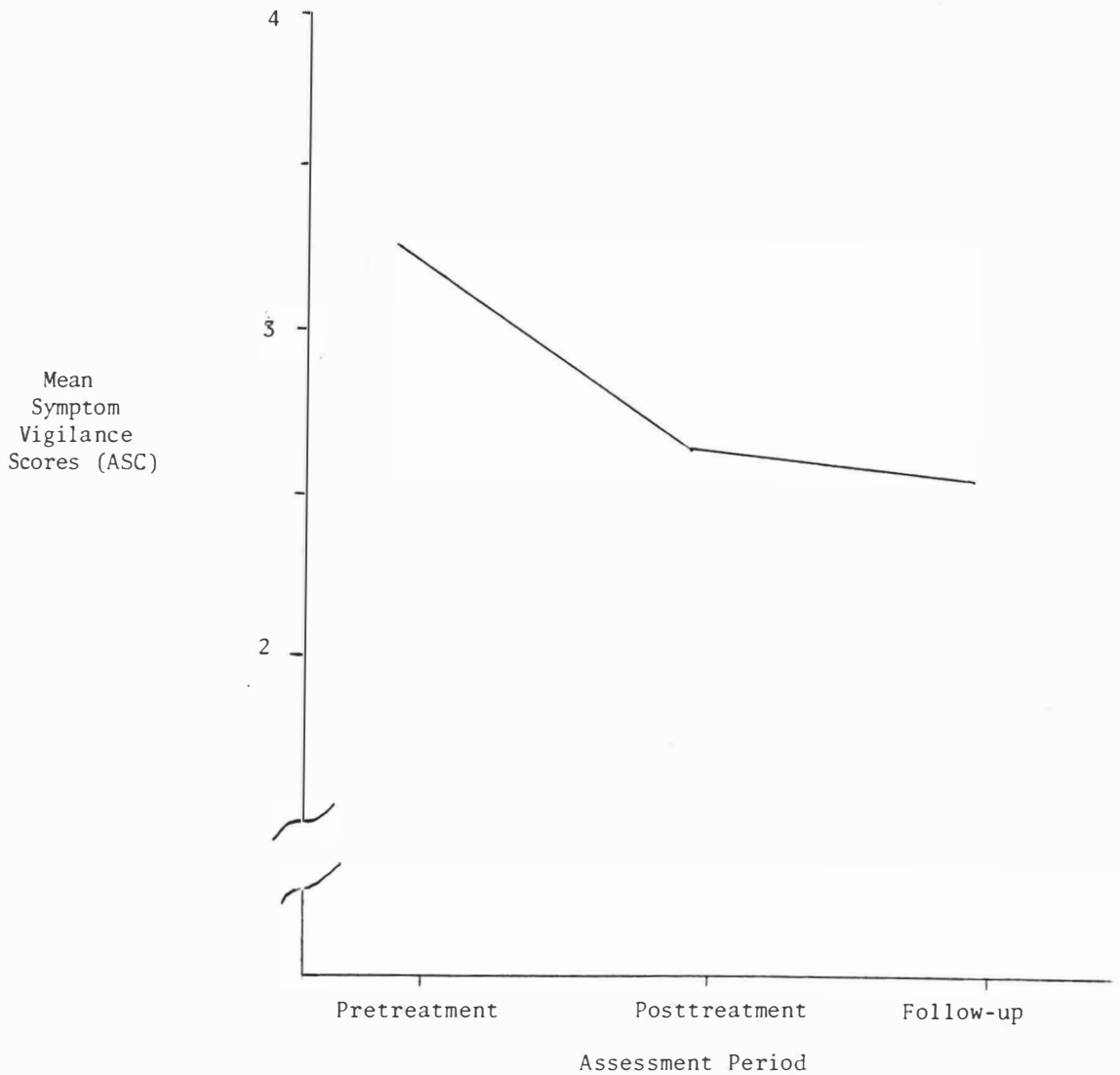


Figure 5. Symptom Vigilance (ASC) scores at pretreatment, posttreatment, and follow-up assessment.

that relaxation therapy should result in a decreased feeling of helplessness in response to asthmatic symptoms.

Variables Related to Outcome

While the analyses in the previous section attempted to assess the efficacy of relaxation with asthmatics regardless of variables such as severity and panic-fear personality type, the analyses in this section were conducted to determine if these variables were associated with successful/unsuccessful response to relaxation training.

The primary statistical analysis employed for this purpose was a Hierarchical Multiple Regression analysis. Three dependent measures (i.e., frequency of attacks; physician ratings; FEV_1/FVC) were utilized in these evaluations. These measures were chosen because they were judged to be the most relevant from their respective classes of dependent measures (i.e., FEV_1/FVC was chosen over other pulmonary function measures because it is more frequently utilized than these other measures in the asthma-treatment research literature). In all cases, two analyses were computed for each dependent measure. The first analysis examined whether pretreatment values on the independent variables predicted post-treatment values on the dependent variables after pretreatment values on the dependent measures were partialled out. The second analysis examined the ability of pretreatment values of the independent variables to predict follow-up values on the dependent variables after post-treatment values of the dependent measures were partialled out. Similar to an Analysis of Covariance (ANACOVA), these analyses were employed to evaluate whether the addition of predictor variables significantly increased the percentage of predictable criterion variance.

Panic-Fear. In a previous section it was demonstrated that at least one of the panic-fear variables (i.e., symptom vigilance) is susceptible to change in response to relaxation therapy. In the current section, the relationship between panic-fear style (as determined by symptom vigilance and panic-fear personality scores) at pretreatment and responsiveness to relaxation training was examined. Since Kinsman et al. (e.g., 1980) have recommended that only specific panic-fear types be "prescribed" relaxation therapy, it was reasonable to predict a significant relationship between these variables and response to treatment. A Hierarchical Multiple Regression analysis was used to examine this hypothesis on the three dependent measures noted above. The results of these analyses are summarized in Table 4.

Niether symptom vigilance nor panic-fear personality type were found to be significantly related to reduced asthma severity (as measured by the PSRS) at either the post-treatment or follow-up periods. Similarly, no relationship was found between these variables and changes in the frequency of asthma attacks at either post-treatment or follow-up. Finally, on the pulmonary function measure (FEV_1/FVC), symptom vigilance was not significantly associated with improvement at either post-treatment or follow-up, however panic-fear personality was found to be significantly related to improvement on this variable at post-treatment ($F(1,10)=5.96$, $p < .05$). The combined R^2 for pretest values on FEV_1/FVC, symptom vigilance, and panic-fear personality was .74 with the latter variable accounting for 16% of the total variance. With the exception of this latter finding, the above results do not seem to support the hypothesis panic-fear personality style is a pertinent variable associated with responsiveness/unresponsiveness to relaxation therapy.

Table 4

Relationships Between Symptom Vigilance (ASC), Panic-Fear Personality (20 P-F) and: Asthma Severity (PSRS); Frequency of Attacks; and Forced Expiratory Volume$_1$/Forced Vital Capacity (FEV_1/FVC)

Step	Variable Added	n	Pretreatment-Posttreatment Increment R^2	Increment R	F	Posttreatment-Follow-up Increment R^2	Increment R	F
			PSRS					
1	PSRS	14	.39	-	7.81*	.84	-	63.89**
2	ASC		.39	0.00	0.00	.84	0.00	0.10
3	20 P-F		.40	0.01	0.07	.85	0.01	0.19
			Frequency of Attacks					
1	Frequency of Attacks	13	.24	-	3.39	.55	-	-13.25**
2	ASC		.25	0.01	0.23	.66	.11	3.17
3	20 P-F		.26	0.01	0.07	.71	.05	1.62
			FEV_1/FVC					
1	FEV_1/FVC	14	.52	-	12.87**	.92	-	143.35**
2	ASC		.58	.06	1.61	.93	0.00	0.54
3	20 P-F		.73	.15	5.96*	.94	0.02	2.87

*$p < .05$
**$p < .01$

Severity. It has been suggested (e.g., Alexander et al., 1979) that severity of asthma may determine one's responsiveness to a treatment such as relaxation therapy. Specifically, that such treatments will be beneficial to only nonsevere asthmatic patients. In the present study it was hypothesized that severity of asthma may indeed be related to favorable/unfavorable response to relaxation therapy, however, only among asthmatics of the extrinsic type. It has been demonstrated that intrinsics respond more favorably to relaxation therapy than extrinsics (e.g., Phillip et al., 1972), and has been hypothesized that no such differential response according to severity would be found among intrinsics. A Hierarchical Multiple Regression analysis was employed to examine whether the severity of illness at pretreatment was indeed related to favorable outcome as measured by decreased frequency of attacks and improved pulmonary performance (i.e., FEV_1/FVC). The results of these analyses are summarized in Table 5.

On the frequency of attacks measure, no significant relationship was found between asthma severity and improvement at either the post-treatment or follow-up period. Similar nonsignificant findings were observed on the FEV_1/FVC variable. These results do not support hypothesis concerning the relationship between severity and responsiveness to relaxation therapy among extrinsic asthmatics.

In addition to these regression analyses, comparisons were made between severe/nonsevere subjects via visual inspection of outcome on the frequency of attack and FEV_1/FVC variables. For the purpose of these comparisons, subjects were divided into severe and nonsevere groups based upon their score on the PSRS (i.e., a score of 4 or greater was defined as severe). This resulted in groups of 10 nonsevere and 5

Table 5

Relationship Between Asthma Severity (PSRS) and: Frequency of Attacks; and Forced Expiratory Volume$_1$/Forced Vital Capacity (FEV_1/FVC)

			Pretreatment-Posttreatment			Posttreatment-Follow up		
				Increment			Increment	
Step	Variable Added	n	R^2	R	F	R^2	R	F
			Frequency of Attacks					
1	Frequency of Attacks	13	.24	-	3.39	.55	-	13.25**
2	PSRS		.24	0.00	0.02	.58	0.03	.75
			FEV_1/FVC					
1	FEV_1/FVC	15	.52	-	12.87**	.92	-	143.35**
2	PSRS		.61	.09	2.53	.92	0.00	0.22

*$p < .05$
**$p < .01$

severe patients on the pulmonary function variable, and 8 nonsevere and 5 severe on the frequency of attacks variable (due to missing data).

The mean number of attacks per week were calculated for the severe and nonsevere subjects. Only the first 9 weeks of the comparison period were utilized since the number of days this information was recorded in week 10 varied from 1 to 7 and it was felt that prorating would not be appropriate. The weekly means for the severe and nonsevere groups on this variable are summarized in Table 6 and were plotted for comparison (see Figure 6).

A review of Figure 6 reveals several points. First, the nonsevere group of asthmatics actually averaged a greater number of attacks per week than the severe asthmatics during each week of the comparison period. Second, with the exception of week 5, the nonsevere group showed a consistent downward trend in the frequency of attacks whereas the severe group remained at a fairly consistent level. It should be noted that in week 5, two of the nonsevere subjects experienced 17 and 21 attacks, respectively, and together accounted for 38 out of the 56 total attacks for this group. While the results of this inspection suggest that the nonsevere subjects may have been more responsive to relaxation therapy than their severe counterparts, this conclusion is complicated by the fact that the severe subjects were at a consistently lower frequency of attacks throughout the comparison period and may not have had any room for further improvement on this particular variable. We will return to this issue in the Discussion section.

The performance of the nonsevere and severe groups was also compared on the FEV_1/FVC variable. The mean performance for the 10 nonsevere and 5 severe subjects was calculated at the pretreatment, post-

Table 6

Mean Weekly Frequency of Asthma Attacks for Severe and Nonsevere Subjects

Group	n	Week								
		1	2	3	4	5	6	7	8	9
Nonsevere	8									
M		6.63	6.13	5.13	5.13	7.00	3.88	4.25	4.25	4.75
SD		4.24	4.42	4.64	4.29	7.96	4.09	6.52	3.92	4.03
Severe	5									
M		3.00	3.00	2.40	3.20	2.00	2.00	2.40	3.00	2.40
SD		3.04	3.56	3.46	3.66	2.55	3.54	2.83	3.76	2.62

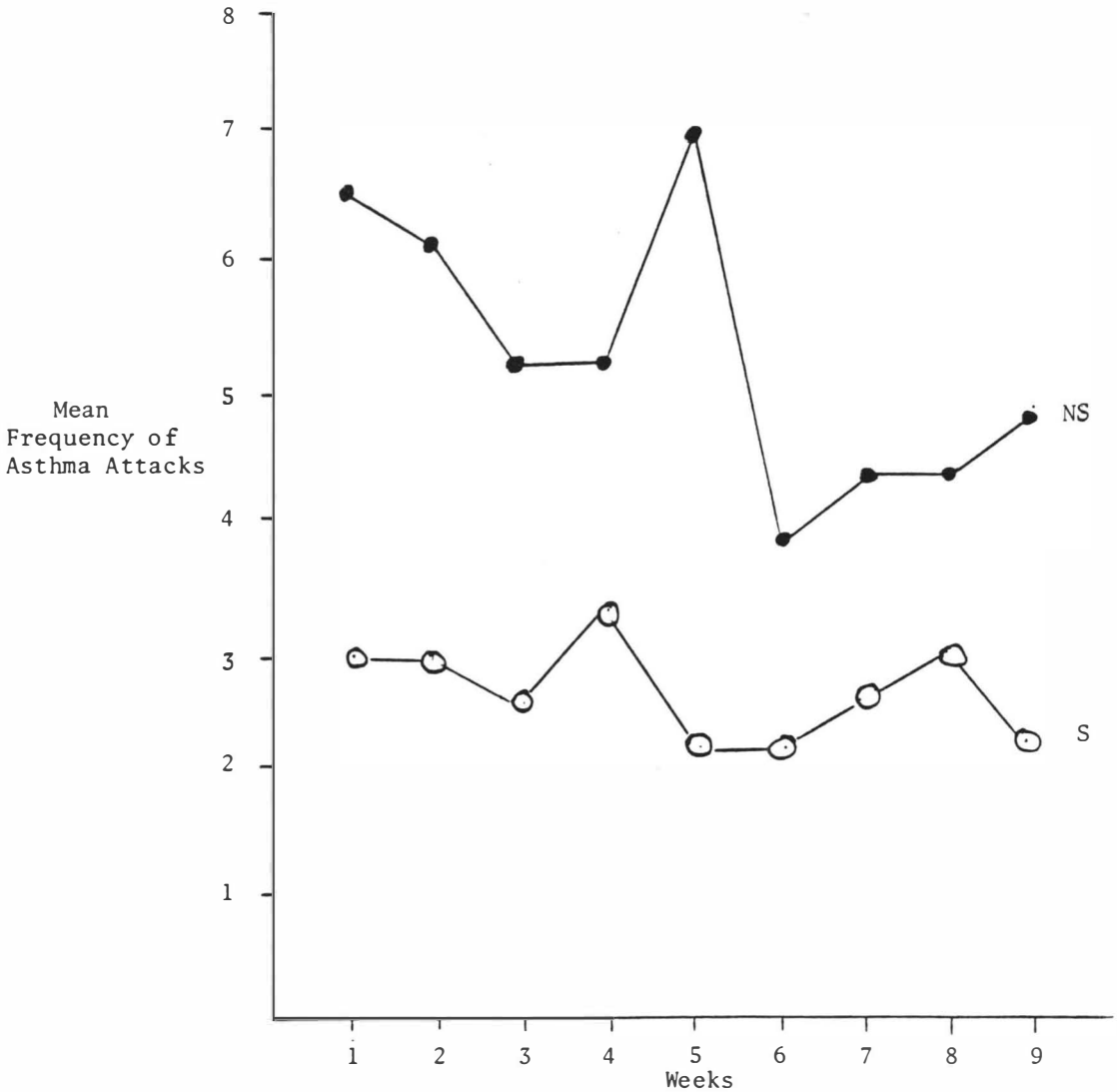


Figure 6. Mean Weekly Frequency of Asthma Attacks for Nonsevere (NS) and Severe (S) Subjects.

treatment and follow-up periods. These values are summarized in Table 7 and plotted in Figure 7.

A review of these results reveals several facts. First, although the severe group performs at a consistently lower level than the non-severe group at each comparison point, performance by these subjects is well within normal limits (i.e., FEV_1/FVC for non-asthmatics is generally between 75%-85%). Second, neither group appears to have improved dramatically on this variable over the course of treatment. In fact, the severe group actually appears to worsen slightly at the follow-up period and the nonsevere group seems to relapse after achieving some minimal gains. These results do not appear to support the hypothesis that severe and nonsevere asthmatic patients respond differentially to relaxation therapy on this variable. As was the case with the frequency of attacks variable, this conclusion is complicated by factors which warrant further discussion. For example, it may be that members of the nonsevere group have reached optimal performance and may not have had room for additional improvement (and thus, a differential response on this variable would be impossible).

Compliance. Common sense would suggest that the degree to which one adheres to a specific treatment program should be related to positive outcome if in fact the treatment is effective. In the current investigation, subjects were requested to practice their relaxation skills for one-half hour daily throughout the treatment and follow-up phases and to record the actual amount of time they practiced. Total practice time was used as a measure of compliance to treatment instructions and it was hypothesized that greater compliance would result in more favorable outcomes. A Hierarchical Multiple Regression analysis was used to examine the relationship between this measure of compliance and favorable out-

Table 7

Mean Performance of Severe and Nonsevere Subjects on the Forced Expiratory $Volume_1$/Forced Vital Capacity (FEV_1/FVC) Measure

Group	n	Assessment Period		
		Pretreatment	Posttreatment	Follow-up
Nonsevere	10			
M		87.70	90.19	87.40
SD		11.12	7.44	8.48
Severe	5			
M		81.90	81.50	77.13
SD		3.94	5.01	6.75

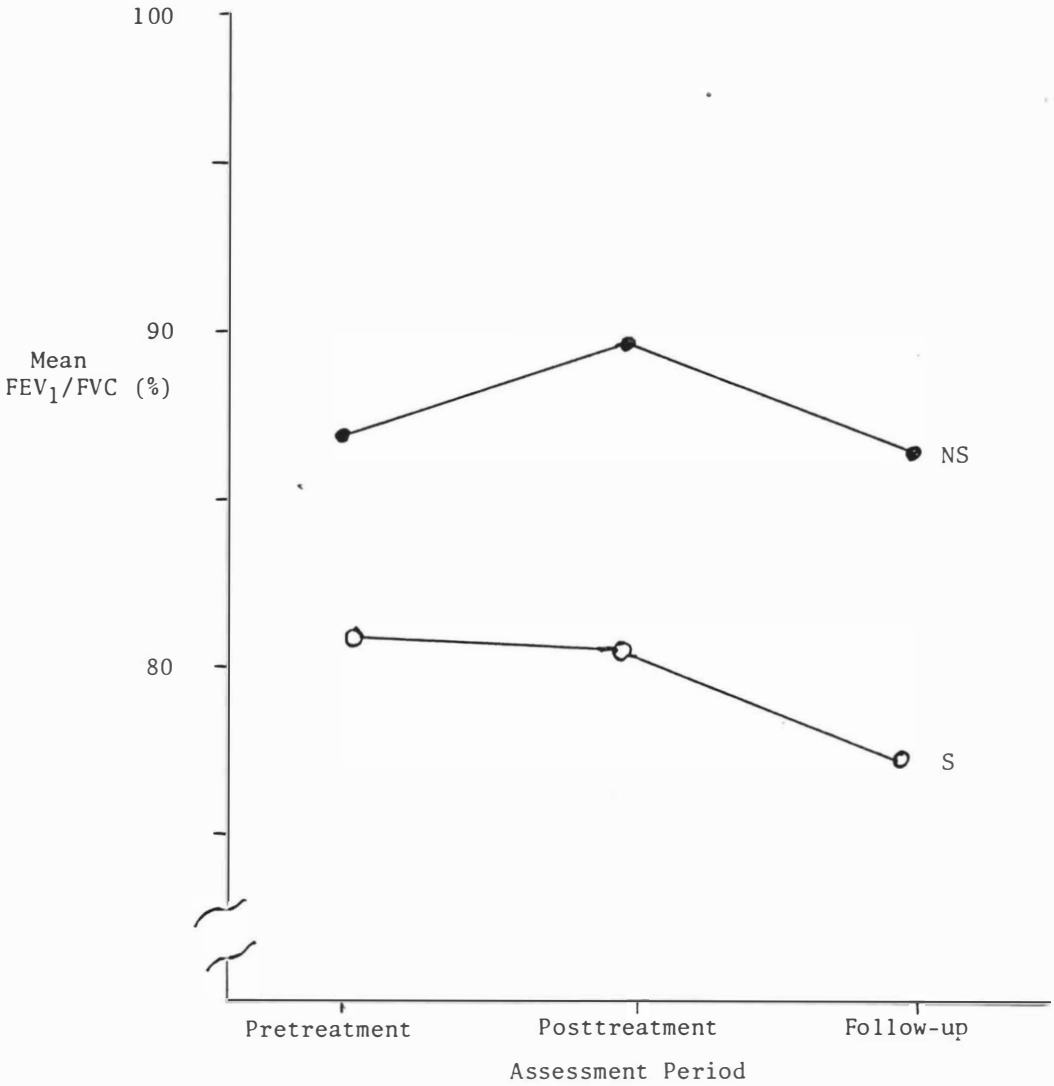


Figure 7. Mean FEV_1/FVC Performance of Nonsevere (NS) and Severe (S) Subjects at Pretreatment, Posttreatment, and Follow-up Assessment

come as measured by the PSRS, FEV_1/FVC, and frequency of asthma attacks. The results of these analyses are summarized in Table 8.

On the Physician's Severity Rating Scale practice time was significantly related to improvement at the post-treatment assessment ($F(1,11)=10.49$, p .01). The combined R^2 for pretreatment severity ratings and practice time was .69 with practice time accounting for 30% of the total variance. Results of analyses of the follow-up period did not demonstrate a significant relationship between compliance and severity ratings. This is not surprising, however, since subjects did not improve significantly on this variable between the post-treatment and follow-up assessments. These results suggest that the amount of time one practices relaxation training can significantly reduce the amount of medication required to control asthmatic symptomatology. No such relationship was found between practice time and frequency of attacks or performance on FEV_1/FVC at either the post-treatment or follow-up periods suggesting that the regular practice of relaxation skills is not related to improvements on these measures.

Table 8

Relationship Between Compliance (i.e., Total Practice Time) and: Frequency of Attacks; Asthma Severity (PSRS); and Forced Expiratory Volume$_1$/Forced Vital Capacity (FEV$_1$/FVC)

			Pretreatment-Posttreatment			Posttreatment-Follow-up		
Step	Variable Added	n	R^2	Increment R	F	R^2	Increment R	F
			Frequency of Attacks					
1	Frequency of Attacks	13	.24	-	3.39	.55	-	13.25**
2	Compliance		.30	.06	.94	.61	.06	1.74
			PSRS					
1	PSRS	14	.39	-	7.81*	.84	-	63.89**
2	Compliance		.69	.30	10.49**	.84	0.00	0.02
			FEV$_1$/FVC					
1	FEV$_1$/FVC	14	.52	-	12.87**	.92	-	143.35**
2	Compliance		.56	.04	1.107	.92	0.00	0.10

*$p < .05$
**$p < .01$

Discussion

The current investigation proposed and examined several hypotheses regarding: 1) the efficacy of relaxation therapy as an adjunct treatment for asthma; and 2) specific psychological and illness variables which should be considered before employing such a treatment strategy. In general, the results of this investigation were inconsistent and somewhat less than robust. Several factors may have contributed to this inconsistency and include: 1) the fact that the study was run during the peak pollen months and at a particularly humid time of year (both factors which affect extrinsic asthmatics);2) all the subjects in this investigation were of the extrinsic or mixed type and as such might not be expected to respond as favorably to relaxation therapy (i.e., as compared to intrinsics); 3) pretreatment performance on one of the more important dependent variables (i.e., FEV_1/FVC) was high enough so that additional gains might not have been possible; 4) baseline levels for severe asthmatics on the frequency of attacks variable were low enough that, again, further gains would be unlikely. Each of these factors will be considered when discussing specific outcomes. The discussion of these specific outcomes will focus upon the following areas: 1) Treatment Implications; 2) Pertinent Psychological and Illness Variables (related to favorable outcome); and 3) Research Implications.

Treatment Implications

While the overall results of this investigation do not unequivocally support the efficacy of relaxation therapy as an adjunct treatment for

bronchial asthma, certain findings do strongly support its utility for this purpose. At the very least, it should become evident that the findings of this study in no way damage the current status of this treatment strategy. In addition to discussing these results, comments can also be offered regarding the importance of compliance and the manner in which the relaxation skill is implemented.

Medication Usage/Physician Ratings. The primary reason for including the Physician's Severity Rating Scale (i.e., severity rating based upon type and level of medication taken to control asthma symptoms) and the self-monitoring of medication intake throughout this study was to eliminate medication usage as a confound when discussing other outcome variables. The results of the analyses of these data rule out medication changes as being responsible for any improvement on the other dependent measures. The results also indicate that medication usage and severity ratings decreased as a function of participation in this treatment program.

While the stated purpose for including these variables in the investigation was not necessarily to effect significant change upon them, these results were the most consistent and perhaps most important findings of this project. If one recalls the fact that physicians follow the principle of "escalation" in the treatment of asthma (i.e., "adding more effective, but more hazardous agents only when simpler drugs have not been effective"; Williams, 1973; p. 38) and the fact that more effective drugs (e.g., prednisone) carry with their usage more severe side effects, the goal of managing asthmatic symptoms on minimal levels of medication can clearly be seen as a worthwhile one. Given that the

physician severity ratings employed in this study were based solely upon medication criteria, the significant decrease on this rating after treatment (and maintained at follow-up) can be viewed as strong support for the utility of relaxation therapy for the treatment of asthmatic symptoms.

Frequency of Attacks. Participation in the relaxation program resulted in a significant decrease in the frequency of asthma attacks when the post-treatment period was compared with the pre-treatment baseline period. This improvement, however, was not maintained at a one-month follow-up period. Subjects were, however, no worse off at this time than at pre-treatment. Such a "relapse" might cause one to question: 1) the long term efficacy of relaxation therapy; 2) the efficacy of relaxation therapy beyond its effects as a placebo. While these are reasonable questions, the data does not sufficiently support these positions.

First, one must consider the fact that the current investigation was conducted during the period between early May and mid-July. This period represents the peak of the pollen season in this geographic region (Williams, 1973; Owens, 1983) and, in addition, it was particularly humid during this time. Of the 13 subjects who completed the Asthma Survey Schedule (AmSS; see Appendix C), 11 reported that their asthma was effected adversely by pollen and/or humidity. In addition, 11 subjects also reported that Spring and/or Summer were more likely times for symptoms to occur than Fall or Winter. This is not surprising when one recalls that all the subjects in this investigation were of the extrinsic or mixed type and are thus adversely affected by external agents such as pollen. In addition to the historical confound of pollen and

humidity, one must also consider the suggestion (i.e., by Phillip et al., 1972) that extrinsic asthmatics may not be as responsive as intrinsic asthmatics to treatments such as relaxation therapy. Finally, it was stated previously that comparisons of relaxation therapy with appropriate control groups have resulted in active and significant treatment effects which speaks directly to the placebo issue (see Knapp and Wells, 1978; Spevack, 1978).

There are several other facts which one must consider when judging the overall effectiveness of relaxation therapy for reducing frequency of asthma attacks. First, it is important to remember that the frequency of attacks did, in fact, decrease during the post-treatment period even though the pollen season was at hand. Second, while subjects did "relapse" by follow-up, they were no worse off than they were at pre-treatment. It is reasonable to speculate that participation in this program may have served to keep attack frequency at a lower level than previous years for this group of asthmatics. Unfortunately, data are not available to test this speculation. Finally, one must consider the fact that the number of attacks experienced by this group did not increase even though, on the average, the amount of medication subjects were using to control asthmatic symptoms decreased. The fact that medication levels could be decreased, without subsequent worsening of symptoms lends support to the role of relaxation therapy in the management of asthmatic symptoms.

Pulmonary Function. Similar to the results concerning the frequency of attacks variable, evidence from the various pulmonary function tests does not clearly support any direct benefits to lung functioning as a

result of learning how to systematically relax. The only significant finding in the expected direction was on the Forced Vital Capacity (FVC) variable at follow-up. In addition, although nonsignificant, trends in the expected direction were observed on the measures of Peak Expiratory Flow Rate (PEFR) and Forced Expiratory Volume in one-second (FEV_1) by the follow-up assessment. Finally, results on the Forced Expiratory Volume in one second/Forced Vital Capacity ratio (FEV_1/FVC) were in the expected direction at post-treatment, however, they significantly decreased by the follow-up assessment. Several comments can be offered regarding the above findings.

First, on those variables which were significant in the positive direction it appears that the benefits of relaxation therapy occurred on a delayed basis. It is quite possible that direct benefits from relaxation therapy on lung functioning may take longer to occur than benefits upon other variables. It may be that relaxation therapy slows down the physiological process in a gradual fashion and hence immediate benefits should not be expected. The observed trends on the PEFR and FEV_1 measures lend some credence to this "delayed effect" hypothesis.

Second, on the measure upon which positive results were found, one would have to question whether such benefits were of clinical or merely statistical significance. For example, on the measure of FVC the mean level at post-treatment was 3.11 liters and at follow-up was 3.35 liters. This represents an improvement of only 5% whereas, as has been previously noted, improvements of less than 15% are not generally considered to be clinically significant. A similar 5% improvement was noted on the Percent-Predicted FVC variable (still smaller increases were found on the remaining pulmonary function measures). If one accepts the premise that relaxation therapy results in delayed pulmonary benefits, perhaps

more clinically relevant results would be observed over time. Unfortunately, longer term follow-up data were not available to investigate this question.

A final point concerns whether one should expect significant pulmonary changes from a subject population composed of extrinsic asthmatics. Phillips et al. (1972) have suggested that intrinsic asthmatics respond more favorably to relaxation therapy than extrinsic asthmatics on measures of pulmonary function. Due to the complex physiology involved in the respiratory system, bronchoconstriction may be the result of parasympathetic nervous system (PNS) or sympathetic nervous system (SNS) malfunctions (i.e., 1) PNS hyperactivity; 2) SNS alpha-adrenergic hyperactivity; 3) SNS beta-adrenergic hypoactivity) and it may be that the responsiveness of lung functioning to relaxation therapy is a function of where an individual's particular respiratory difficulty is located. For example, if one class of asthmatics suffered symptoms as a result of PNS hyperactivity, relaxation therapy would be contraindicated since one of its effects is to increase PNS dominance. On the other hand, if the intense physiological arousal associated with stress interferes with the SNS adrenergic receptors in some maladaptive way with another subset of asthmatics, then relaxation therapy might be indicated because it would serve to decrease such arousal. One could speculate further that intrinsic and extrinsic asthmatics may differ in their responsiveness to relaxation therapy because of a differential physiological cause of their respective symptomatology. This is clearly speculation and would warrant further study.

The only clear statement which can be made about the results obtained on the pulmonary function variables is that they are inconclusive and inconsistent. It should be noted, though, that the inconclusiveness of the results of this study does not preclude the potential of relaxation therapy having beneficial effects on the respiratory functioning of certain asthmatics since only extrinsic and mixed asthmatic types participated.

Panic-Fear Variables. The susceptibility to change in response to relaxation therapy of two separate measures of panic-fear were examined in this investigation. It was hypothesized that the measure of symptom vigilance (i.e., as measured by the Asthma Symptom Checklist) would decrease in response to relaxation therapy since it has been described as a "state" measure of panic-fear by its developers (e.g., Dirks et al., 1977c). It was also hypothesized that panic-fear personality scores (as measured by the 20 P-F) would decrease in response to relaxation therapy even though it has been described as a "trait" measure by its developers (e.g., Dirks et al., 1977c). The reasoning behind the latter hypothesis was that learning a skill such as relaxation therapy would result in an increased sense of mastery over one's symptoms and a subsequent decrease in the feeling of helplessness associated with high panic-fear personality. The former hypothesis was confirmed while the latter was not.

Several points can be made regarding the decrease in symptom vigilance scores. First, the description of symptom vigilance as a "state" measure has been supported in this case. Second, even though this has been confirmed, some would question whether it can be viewed as improvement. For example, Kinsman et al. (1980a) have suggested that

high symptom vigilance is adaptive and that relaxation therapy may be detrimental if it reduces such vigilance. The positive results obtained on other outcome variables (e.g., Physician Severity Rating Scale; frequency of attacks; Forced Vital Capacity), however, do not support such an argument. It could be argued, however, that if symptom vigilance scores had remained unchanged the results of the current investigation would have been more clearly and consistently supportive of the efficacy of relaxation therapy. It would appear, however, that other factors (e.g., the historical confound of pollen season; no intrinsic asthmatic subjects) more readily accounted for this inconsistency. The relationship between systematic increases or decreases in symptom vigilance scores as a function of treatment to favorable/unfavorable outcome does seem to warrant further study, however.

Regarding the panic-fear personality variable (i.e., as measured by the 20 P-F), the following can be stated. First, the status of this variable as a "trait" variable has been supported since scores did not decrease significantly. Interestingly, several subjects did "anecdotally" report an increased feeling of control in previously stressful situations which they attributed to the relaxation therapy. It was their feeling that the decreased stress response was helpful in controlling their asthma on these occasions. While such anecdotal evidence is encouraging, it certainly does not objectively address the utility of relaxation therapy for effecting change on this variable. One could speculate that, similar to the pulmonary function variables, changes in panic-fear personality may occur only on a gradual basis. Such gradual change would be entirely consistent with the notion of this variable as a trait characteristic. At this point, however, such

speculation remains grist for the research mill.

Compliance. If one presupposes the efficacy of a given treatment program, it follows that the degree to which one adheres to the instructions of that program will be related to improvement of the problem it was designed to address. In the current investigation, subjects were required to complete 5 sessions of relaxation training in addition to practicing this skill on a daily basis. Compliance as the amount of time subjects practiced on their own throughout this study was hypothesized to predict improvement on several dependent measures, however, this hypothesis was only clearly supported by the significant relationship between practice time and physican severity ratings (i.e., the relationship between compliance and frequency of attacks; FEV_1/FVC; was nonsignificant). While these results did not consistently support the importance of adherence to treatment instructions, the finding that such adherence was related to decreased dosages of asthma medication without subsequent worsening of symptoms does lend some support to its utility.

Pertinent Psychological and Illness Variables

In addition to attempting to reconfirm the efficacy of relaxation therapy for the treatment of bronchial asthma, a second purpose of this investigation was to identify and examine those variables hypothesized to differentiate between favorable and unfavorable response to this treatment. Unfortunately, this latter objective was only partially achieved.

A primary reason for this less than successful outcome was that the group of subjects who ultimately completed the entire treatment program was far smaller than anticipated. Despite attempts to recruit a substantial number of asthmatics (i.e., an original list of over

50 potential participants was compiled; and this does not include those who were contacted but said they were not at all interested) of varying asthma type, severity, and panic-fear type, the size of the final sample limited the scope of this endeavor somewhat. A major problem associated with the relatively small number of subjects is that it is very possible that real differences went undetected due to the reduced power of the statistical analysis employed. Be that as it may, this portion of the investigation did at least reveal some points which warrant speculation and further investigation.

Panic-Fear Variables. Kinsman et al. (e.g., 1980a) have cautioned that anxiety reduction strategies such as relaxation therapy may be appropriate for only 2 of 9 panic-fear subtypes and may indeed be contraindicated for certain other subtypes. Based on this recommendation, it was predicted that panic-fear type at pretreatment would be significantly related to outcome at either post-treatment, follow-up, or both. With exception of the significant relationship found between scores on the panic-fear "trait" measure (i.e., the 20 P-F) and FEV_1/FVC at post-treatment, the predicted relationship between these variables (i.e., symptom vigilance and personality) and outcome was not supported.

Several comments are in order regarding these results. Despite the general lack of significance, the one significant relationship found was precisely in the direction predicted by Kinsman and his associates. That is, the fact that panic-fear trait scores at pretreatment were positively related to improvement on FEV_1/FVC at post-treatment is consistent with the recommendation by these authors that relaxation therapy is only appropriate for asthmatics who are categorized as high panic-fear personality types. This finding lends at least partial support to their recommendations. Third, it is interesting to note that of the three sub-

jects who scored higher than 9 on the 20 P-F (i.e., and hence were categorized as high on panic-fear personality), two had scores within the moderate range at post-treatment and the remaining subject decreased to within one point of the moderate range. Finally, anecdotal reports noted previously lend some credence to the notion that relaxation may result in an increased sense of mastery over one's illness (whereas high panic-fear scores at pre-treatment are associated with feelings of helplessness and lack of control over one's symptoms).

Given the significant result which was observed in addition to the less rigorous, yet nevertheless, interesting observations, further investigation into the use of panic-fear type as a selection criteria for relaxation-type strategies is warranted. Since no study (with the exception of the present one) of this type has been implemented, and, since the small N of the current study precludes the drawing of any firm conclusions pro or con, such further investigation is clearly called for.

Severity. It has been suggested that relaxation therapy is effective only with nonsevere asthmatic patients and, even then, may be beneficial only because of placebo effects (e.g., Alexander et al., 1979). In the present study it was also hypothesized that asthma severity may indeed be an important variable to consider when electing to employ an anxiety reducing strategy. It was speculated that severe asthmatics of the intrinsic type might be appropriate candidates for this treatment and that the conclusions drawn by Alexander et al. (1979) were premature because they failed to consider the asthma type of their patients. While the current investigation was unable to examine this latter hypothesis (i.e., because no intrinsics participated), it was

still reasonable to predict a significant relationship between asthma severity and outcome based upon the rationale that extrinsic asthmatics should respond differentially according to this variable.

The reader will recall that none of the analyses used to examine this issue revealed such a relationship. For example, when severity at pre-treatment was used to predict outcome on the frequency of attacks and FEV_1/FVC variables, no significant relationships were found. Similarly, the visual inspection data which examined outcome on these same two variables were inconclusive and failed to support the importance of asthma severity as a pre-treatment selection criteria.

Despite the apparent lack of support, several factors preclude the dismissal of asthma severity as a pertinent illness variable vis-a-vis relaxation therapy. First, severity of asthma in this case (and in most cases) was not determined by the number of attacks a given individual experienced but rather by the type and level of medication required to control these attacks. Thus, it may be that the severe subjects in this comparison were on high enough levels of medication that the frequency of attacks they experienced had "bottomed out" and hence it would have been difficult to demonstrate further improvement on this variable. In contrast, the nonsevere subjects experienced a consistently greater number of attacks throughout this investigation and hence did have the "opportunity" to achieve some improvement (i.e., recall that a downward trend in frequency of attacks was noted among nonsevere asthmatics whereas no such trend was evident among the severe subjects). In a similar vein, it should be noted that not only was the relationship between severity and frequency of attacks nonsignificant using the regression analysis, neither was it in the expected direction (i.e.,

severity was negatively associated with frequency of attacks). It may be that frequency of attacks is not an appropriate measure to use for this particular purpose unless severe and nonsevere subjects do not significantly differ on this variable at pretreatment. Such was obviously not the case in this investigation.

While severe and nonsevere subjects did differ substantially in terms of frequency of attacks at pre-treatment, such a difference did not exist on the measure of FEV_1/FVC which posed additional difficulties. The reader will recall that neither severe or nonsevere subjects improved dramatically on this variable as indicated in Figure 10. Since both groups performed within normal limits throughout the investigation, it is quite possible that further improvements were not likely due to a "topping out" phenomenon. In a related matter, it appears that the participants in this study were of the episodic versus the chronic type given that none of the subjects could be categorized as severe according to accepted pulmonary standards (e.g., The Intermountain Thoracic Society defines severe as an FEV_1/FVC of less than 45%; Cooper, 1982). One would not expect dramatic improvements on this variable from episodic asthmatics since, by definition, they usually perform within normal limits except when experiencing attacks. In spite of the above factors, a nonsignificant relationship in the expected direction was observed between severity at pretreatment and FEV_1/FVC performance at both post-treatment and follow-up. Thus, it may be that a real relationship does exist between these variables but went undetected as a result of the relatively small number of subjects involved.

In concluding this section the following can be stated: 1) the relationship between asthma severity and responsiveness to relaxation

therapy has not been adequately tested; 2) the crucial study of the relationship between asthma type, severity and responsiveness to relaxation therapy was not adequately addressed and should be in future studies; 3) It is clear that the jury is still out (and will remain out) regarding these relationships pending further investigation.

Research Implications

Future Directions. As indicated previously, the results of the current investigation are somewhat inconsistent and less than clear-cut. A major factor associated with this status is the relatively small number of patients who completed the entire program. In addition, the sample examined was limited in terms of variety (i.e., no intrinsic asthmatics, not a wide range of panic-fear types). As a result of these limitations, further investigation seems warranted and necessary for progress to be made in this area. A summary of these salient areas for future research is presented below.

One crucial area for investigation concerns the further identification and delineation of variables which predict response to relaxation therapy. The current study attempted an initial examination of the relationship between: panic-fear personality type; asthma severity; and responsiveness to treatment. However, while the findings of this study are suggestive, they are also limited and unclear and warrant further investigation on a larger scale. For example, to adequately examine the predictive ability of the panic-fear variables of favorable response to treatment, a larger and more representative sample of the 9 panic-fear subtypes is needed. Similarly, the investigation of the severity variable would be improved if both physician ratings and pulmonary measures of severity were used as predictors.

Another crucial question which requires further examination is the relationship between asthma type and successful response to relaxation therapy. Given the potential degree to which a variable such as asthma type could influence findings in other investigations, it seems crucial that its role be clarified. In a similar vein, speculation concerning a differential physiological basis for the intrinsic and extrinsic asthmatic, and the possibility that this differential cause could be related responsiveness to relaxation therapy, certainly calls for further investigation.

Another area which requires further clarification concerns which type of relaxation strategy results in the most favorable outcome. For example, this writer has seriously questioned the conclusions of Erskine-Millis and Schonell (1981) regarding the superior utility of "mental" versus "muscular" relaxation techniques. In addition, it seems worthwhile to investigate the relative contributions of "active" and "passive" uses of the relaxation skill. Since the current study employed a strategy which included each of the above components, neither of these issues could be addressed. It may be that certain subtypes of asthmatics respond to one form or another of relaxation therapy to the exclusion of other types or components. Also, it is possible that strategies which include several components (i.e., like the current study) are redundant and would be more efficient if streamlined. Additional topics which warrant examination include: 1) whether EMG-feedback assisted relaxation is superior to systematic relaxation alone; and 2) the comparative efficacy of EMG-assisted techniques and systematic desensitization. In any case, it seems clear that the final word has not been spoken in this area.

Still another area which calls for further consideration involves the relationship between variables such as assertiveness, asthma type/severity, panic-fear type and intractability of symptoms. While several authors have posited that a substantial number of asthmatics are, by and large, unassertive (e.g., Cohen, 1977; Groen, 1979), no study to this date has attempted to assess the relative assertiveness (or lack thereof) of asthmatic patients as compared to the general population. It may be that asthmatics are no more unassertive than nonasthmatics, however, those asthmatics who do possess such an interpersonal style may have greater difficulty coping with stress than their more assertive counterparts. This difficulty coping with stress may in turn complicate their symptom picture. In support of this possibility are the findings by Teiramaa (1978a; 1978b; 1978c; 1979a) that introversive tendencies are associated with: unfavorable prognosis of asthma; severity of symptoms; longer duration of symptoms; and intrinsic as opposed to extrinsic asthma type. Thus, it is possible that an introversive (i.e., passive) personality style overlaps with variables such as asthma type, asthma severity, and panic-fear personality to predict responsiveness/unresponsiveness to relaxation-type strategies. Such an inter-relationship of potential predictor variables certainly warrants further study.

While the above discussion of necessary research endeavors in the area of asthma treatment is not all inclusive, it does serve to call attention to the fact that research possibilities in this area are abudant. Perhaps the ideal manner in which the above issues could be addressed would be in a large scale "grid model" type fashion which would enable one to examine several factors/issues simultaneously (e.g.,

Kiesler, 1969). While such an endeavor would be worthwhile, it has its obvious practical limitations. Short of such an effort, several studies of the type implemented by this writer (on a larger scale) would prove beneficial providing the variables identified by this writer are controlled for adequately.

Methodology. The self-monitoring form utilized in this study (i.e., the DAF) was designed for the collection of several pieces of potentially relevant data. These included: frequency, duration, and self-ratings of intensity of asthma attacks; and, the amount and type of asthma medication ingested on a daily basis. Unfortunately, the duration and intensity of attacks data were unavailable for analysis due to forgetfulness and/or imprecise record keeping on the part of certain subjects. Such information would have been useful in that it would have made the analysis of outcome on the asthma attack variable more complete (i.e., decreases in intensity and duration would have reflected improvement even had the actual number of attacks remained unchanged).

Given the loss of this important information due to its questionable reliability, validity, and accuracy, comments concerning ways to improve the recording of these data seem in order. First, regarding the recording of duration data, perhaps it would have been helpful if the data collection form had a space for "time attack began" and "time attack ended" instead of the current "how long did the attack last". Such structure may have improved the accuracy of this information. Second, it may have been helpful if subjects were given more specific guidelines as to what constituted the beginning and end of an attack. It appeared that some patients followed the instructions precisely and reported attack onset at the first sign of symptoms (e.g., mild wheezing, whereas

others did not begin counting attacks until symptoms became more pronounced. Although subjects were told that an attack was defined as "the initial onset" of even very mild symptoms, perhaps some pre-treatment self-rater training would have been helpful towards achieving greater consistency. Finally, similar pre-treatment rater training would have helped subjects assess the intensity of attacks in a more reliable fashion

The use of self-monitoring data in treatment outcome studies is always less than ideal in terms of accuracy, reliability, and objectivity. Unfortunately, when examining a disorder such as asthma there is no way these data can be excluded in favor of more "objective" pulmonary measures or physician ratings. The most complete study should include information from each of these domains and attempts should be made to make this data as useful and usable as possible.

Conclusion

The current investigation had two primary objectives. First, this study was proposed as an attempt to reconfirm the utility of relaxation therapy as an adjunct strategy for the treatment of bronchial asthma. Second, it was also hoped to examine specific psychological and illness variables which could potentially predict responsiveness/unresponsiveness to such a treatment technique. The results of this investigation were inconsistent and, as such, the former objective has been only partially accomplished whereas the latter objective was merely addressed.

The strongest and perhaps most important finding of this investigation was that the mean severity rating of subjects who participated in this program decreased as a function of this participation. Since this severity rating was based upon medication usage and a lower rating reflects decreased dependence upon medication to manage symptoms, this

is indeed an important outcome. Further, when one considers the potentially extreme side effects associated with certain asthma medications, this result takes on additional significance. In addition to this outcome, relaxation therapy apparently had some beneficial effects upon decreasing the frequency of attacks and improving lung functioning as assessed by some, but not all, of the pulmonary assessments utilized. Thus, the utility of relaxation therapy was at least partially supported by the current study.

Regarding the attempt to assess potential predictors of responsiveness/unresponsiveness to relaxation therapy, the current attempt was less than successful. At best, the data lent some minimal credence to previous speculations that variables such as asthma type, asthma severity and panic-fear type should be considered before"prescribing" relaxation study. At worst, the present study demonstrated that the further investigation of these and other variables is certainly warranted.

In conclusion, it seems that the most important issues which remain inadequately addressed are those which attempt to delineate which subjects will respond favorably to which treatments under what conditions (c.f., Kiesler, 1966; Paul, 1970). Until such variables have been adequately assessed, statements concerning the "blanket indictment of anxiety reduction techniques in asthma" and the "indictment of blanket application" (Kinsman et al., 1980a) of such techniques can not be made conclusively. In addition, clinicians and researchers would do well to pay more heed to the complex and heterogeneous nature of the asthmatic population pending the outcome of such investigations.

REFERENCES

Abramson, H.A. & Peshkin, M.M. Psychosomatic group therapy with parents of children with intractable asthma III: The Kohl Family. Journal of Asthma Research, 1978, 16 (1), 21-40.

Agarwal, K. & Setti, J.P. A study of psychogenic factors in bronchial asthma. Journal of Asthma Research, 1978, 15 (4), 191-198.

Aitken, R.C.B., Zeally, A.K., & Barrow, C.G. The treatment of psychopathology in bronchial asthmatics. In Physiology, emotion and psychosomatic illness. Ciba Foundation Symposium 8, Amsterdam: Associated Scientific Publishers, 1972.

Alexander, F. Psychosomatic medicine: Its principles and applications. New York: W.W. Norton and Company, Inc., 1950.

Alexander, F., French, T.M., & Pollock, D.H. Psychosomatic specificity. Chicago: University of Chicago Press, 1968.

Alexander, A. Systematic relaxation and flow rates in asthmatic children: Relationship to emotional participants and anxiety. Journal of Psychosomatic Research, 1972, 16, 405-410.

Alexander, A., Cropp, G., & Chai, H. Effects of relaxation training on pulmonary mechanics in children with asthma. Journal of Applied Behavioral Analysis, 1979, 12 (1), 27-35.

Alexander, A., Miklich, D.R., & Hershoff, H. The immediate effects of systematic relaxation training on peak expiratory flow rates in asthmatic children. Psychosomatic Medicine, 1972, 34, 388-394.

American Lung Association. What everyone should know about asthma. Massachusetts: Channing L. Bete Co., 1977.

American Lung Association. Facts about your lungs. American Lung Association, 1979.

American Lung Association. The strange case of the white rabbit: A teacher's guide to asthma in children. American Lung Association, 1976.

American Psychiatric Association. Quick reference to the diagnostic criteria from DSM-III. Washington, D.C.: American Psychiatric Association, 1980.

Anderson, R.A. Stress power: How to turn tension into energy. New York: Human Sciences Press, 1978.

Baker, C. (Publisher), Physician's Desk Reference. 33rd Edition. New Jersey: Medical Economics Company, 1979.

Bastiaans, J. & Groen, J. Psychogenesis and psychotherapy of bronchial asthma. In D. O'Neil, Modern trends in psychosomatic medicine. London: Butterworth and Co., 1955.

Blanchard, E.B. Behavioral assessment of psychophysiologic disorders. In D.H. Barlow (Ed.), Behavioral Assessment of Adult Disorders. New York: The Guilford Press, 1981.

Blanchard, E.B. & Ahles, T.A. Behavioral treatment of psychophysiological disorders. Behavior Modification, 1979, 3 (4), 518-549.

Cautela, J.R. The Asthma Survey Schedule. In J.R. Cautela, Organic Dysfunction Survey Schedules. Illinois: Research Press, 1981.

Cherniack, R.M. Pulmonary function testing. Philadelphia: W.B. Saunders Company, 1977.

Clark, T.J.H. Corticosteroids. In T.J.H. Clark & S. Godfrey (Eds.), Asthma. Philadelphia: W.B. Saunders Company, 1977.

Clark, T.J.H. Adult Asthma. In T.J.H. Clark & S. Godfrey (Eds.), Asthma. Philadelphia: W.B. Saunders Company, 1977.

Clark, T.J.H. & Godfrey, S. Asthma. Philadelphia: W.B. Saunders Company, 1977.

Cohen, W.I. Psychological factors. In T.J.H. Clark & S. Godfrey (Eds.), Asthma. Philadelphia: W.B. Saunders Company, 1977.

Collisson, D.R. Hypnotherapy in the management of asthma. American Journal of Clinical Hypnosis, 1968, 11, 6-11.

Cooper, A.J. A case of bronchial asthma treated by behavior therapy. Behavior Research and Therapy, 1964, 1, 351-356.

Cooper, K.R. Director of Pulmonary Function Lab at Medical College of Virginia. Personal Communication, November 9, 1982.

Dahlem, N.W. & Kinsman, R.A. A divergence between subjective report and behavioral patterns. Perceptual and Motor Skills, 1978, 46 (1), 95-98.

Dahlem, N.W., Kinsman, R.A., & Horton, D.J. Panic-fear in asthma: Requests for as-needed medications in relation to pulmonary function measurements. Journal of Allergy and Clinical Immunology, 1977, 60, 295-300.

Danker, P.S., Miklich, D.R., Pratt, C., & Creer, T.L. An unsuccessful attempt to instrumentally condition peak expiratory flow rates in asthmatic children. Journal of Psychosomatic Research, 1975, 19, 209-213.

Davidson, G.C. & Neale, J.M. Abnormal Psychology: An experimental clinical approach. New York: John Wiley and Sons, Inc., 1974.

Davis, M.H., Saunders, D.R., Creer, T.L., & Chai, H. Relaxation training facilitated by biofeedback apparatus as a supplemental treatment in bronchial asthma. Journal of Psychosomatic Research, 1973, 17, 121-128.

Dekker, E., Pelser, H.E., & Groen, J. Conditioning as a cause of asthmatic attacks. Journal of Psychosomatic Research, 1957, 2, 97-108.

Dirks, J.F., Fross, K.H., & Evans, N.W. Panic-fear in asthma: Generalized personality trait vs. specific situational state. Journal of Asthma Research, 1977c, 14 (4), 161-167.

Dirks, J.F., Jones, N.F., & Fross, K.H. Psychosexual aspects of the panic-fear personality types in asthma. Canadian Journal of Psychiatry, 1979b, 24, 731-739.

Dirks, J.F., Jones, N.F., & Kinsman, R.A. Panic-Fear: A personality dimension related to intractability in asthma. Psychosomatic Medicine, 1977b, 39 (2), 120-126.

Dirks, J.F. & Kinsman, R.A. Clinical prediction of medical rehospitalization: Psychological assessment with the battery of asthma illness behavior. Journal of Personality Assessment, 1981, 45 (6), 608-613.

Dirks, J.F., Kinsman, R.A., Horton, D.J., Fross, K.H., & Jones, N.F. Panic-fear in asthma: Rehospitalization following intesne long-term treatment. Psychosomatic Medicine, 1978c, 40 (1), 5-13.

Dirks, J.F., Kinsman, R.A., Jones, N.F., & Fross, K.H. New developments in panic-fear research in asthma: Validity and stability of the MMPI panic-fear scale. British Journal of Medical Psychology, 1978a, 51, 119-126.

Dirks, J.F., Kinsman, R.A., Jones, N.F., Spector, S.L., Davidson, P.T., & Evans, N.W. Panic-fear: A personality dimension related to length of hospitalization in respiratory illness. Journal of Asthma Research, 1977a, 14 (2), 61-67.

Dirks, J.F., Klieger, J.H., & Evans, N.W. ASC panic-fear and length of hospitalization in asthma. Journal of Asthma Research, 1978b, 15 (2), 95-97.

Dirks, J.F., Paley, A., & Fross, K.H. Panic-fear research in asthma and the nuclear conflict theory of asthma: Similarities, differences and implications. British Journal of Medical Psychology, 1979a, 52, 71-76.

Dirks, J.F., Schraa, J.C., Brown, E.L., & Kinsman, R.A. Psycho-maintenance in asthma: Hospitalization rates and financial impact. British Journal of Medical Psychology, 1980, 53 (4), 349-354.

Edfors-Lubs, M.L. Allergy in 7000 twin pairs. Acta Allergolocica, 1971, 26, 249-285.

Erskine-Millis, J. & Schonell, M. Relaxation therapy in asthma: A critical review. Psychosomatic Medicine, 1981, 43 (4), 365-372.

Erskine, J. & Schonell, M. Relaxation therapy in bronchial asthma. Journal of Psychosomatic Research, 1979, 23 (2), 131-139.

Evans, H.E. What happens when a child has asthma? American Lung Association, 1979, (6), 1-5.

French, T.N. & Alexander, F. Psychogenic factors in bronchial asthma. In D. O'Neill, Modern trends in psychosomatic medicine. London: Butterworth and Co., 1955.

Gold, W.M. Asthma. American Lung Association, 1976, 1-6.

Goyeche, J., Yukihiro, A., & Ikemi, Y. Asthma: The Yoga perspective Prt I: The somatopsychic imbalance in asthma: Towards a holistic therapy. The Journal of Asthma Research, 1980, 17, 111-121.

Graham, D.T. Psychosomatic medicine. In N.S. Greenfield and R.A. Sternbach (Eds.), Handbook of psychophysiology. New York: Holt, Rinehart and Winston, Inc., 1972, 839-924.

Graham, P.J., Rutter, M.L., Yule, W. & Pless, I.B. Childhood asthma: A psychosomatic disorder? Some epidemiological considerations. British Journal of Preventive Medicine, 1967, 21, 78-85.

Greenfield, N.S. & Sternbach, R.A. Handbook of psychophysiology. New York: Holt, Rinehart and Winston, Inc., 1972.

Grinker, R.R. & Aronson, J. Psychosomatic concepts: Revised edition. New York: Jason Aronson, Inc., 1973.

Groen, J.J. & Pelser, H.E. Experience with and results of, group psychotherapy in patients with bronchial asthma. Journal of Psychosomatic Research, 1960, 4, 191-205.

Groen, J.J. The psychosomatic theory of bronchial asthma. Psychotherapy and Psychosomatics, 1979, 31, 38-48.

Gross, N.J. What is this thing called love? - or, defining asthma. American Review of Respiratory Disease, 1980, 121, 203-204.

Hatzenbuehler, L.C. & Schroeder, H.E. Desensitization procedures in the treatment of childhood disorders. Psychological Bulletin, 1978, 84 (4), 831-844.

Hock, R.A., Rogers, C.H., Reddi, C., & Kennard, D.W. Medico-psychological interventions in male asthmatic children: An evaluation of physiological change. Psychosomatic Medicine, 1978, 40 (3), 210-215.

Jackson, M. Statement on spirometry in primary practice. Virginia: Virginia Lung Association, 1975.

Jacobson, E. Progressive Relaxation. Chicago: The University of Chicago Press, 1938.

Jones, N.F., Kinsman, R.A., Dirks, J.F., & Dahlem, N.W. Psychological contributions to chronicity in asthma: Patient response styles influencing medical treatment and its outcome. Medical Care, 1979, 17 (11), 1103-1118.

Kahn, A.V. Present status of psychosomatic aspects of asthma. Psychosomatics, 1973, 14, 195-200.

Kiesler, D.J. Some myths of psychotherapy research and the search for a paradigm. Psychological Bulletin, 1966, 65, 110-136.

Kinsman, R.A., Dirks, J.F. & Dahlem, N.W. Noncompliance to prescribed-as-needed (PRN) medication use in asthma: Usage patterns and patient characteristics. Journal of Psychosomatic Research, 1980d, 24 (2), 97-107.

Kinsman, R.A., Dirks, J.F., Dahlem, N.W., & Heller, A.S. Anxiety in asthma: Panic-fear symptomatology and personality in relation to manifest anxiety. Psychological Reports, 1980c, 46 (1), 196-198.

Kinsman, R.A., Dirks, J.F., & Jones, N.F. Psychomaintenance of chronic physical illness: Clinical assessment of personality styles affecting medical management. In T. Millon, C. Green, & R. Meagher (Eds.), Handbook of Clinical Health Psychology. New York: Plenum Publishing Co., 1980a; in press.

Kinsman, R.A., Dirks, J.F., Jones, N.F., & Dahlem, N.W. Anxiety reduction in asthma: Four catches to general applications. Psychosomatic Medicine, 1980b, 42 (4), 397-405.

Kinsman, R.A., Dahlem, N.W., Spector, S., & Standenmayer, H. Observations on subjective symptomatology, coping behavior, and medical decisions in asthma. Psychosomatic Medicine, 1977, 39, 102-119.

Kinsman, R.A., Luparello, T., O'Banion, K., & Spector, S. Multidimensional analysis of the subjective symptomatology of asthma. Psychosomatic Medicine, 1973, 35, 250-267.

Kinsman, R.A., Spector, S., Shucard, D.W., & Luparello, T.J. Observations on patterns of subjective symptomatology of acute asthma. Psychosomatic Medicine, 1974, 36, 129-143.

Kleeman, S. Psychophysiologic disorders. In P. Solomon and V. Patch, Handbook of Psychiatry. California: Lange Medical Publications, 1971.

Klieger, J.H. & Dirks, J.F. Medication compliance in chronic asthmatic patients. Journal of Asthma Research, 1979, 16 (3), 93-96.

Knapp, P.H. Free association as a biopsychosocial probe. Psychosomatic Medicine, 1980, 42 (1:11), 197-219.

Knapp, T.J. & Wells, L.A. Behavior therapy for asthma: A review. Behavior, Research and Therapy, 1978, 16, 103-115.

Kotses, H., Glaus, K.D., Bricel, S.K., Edwards, J.E., & Crawford, P.L. Operant muscle relaxation and peak expiratory flow rate in asthmatic children. Journal of Psychosomatic Research, 1978, 22, 17-23.

Kotses, H., Glaus, K.D., Crawford, P.L., Edwards, J.E., & Scherr, M.S. Operant reduction of frontalis EMG activity in the treatment of asthma in children. Journal of Psychosomatic Research, 1976, 20, 453-459.

Lachman, S.J. Psychosomatic disorders: A behavioristic interpretation. New York: John Wiley and Sons, Inc., 1972.

Lang, P.J., Rice, D.G. & Sternbach, R.A. The psychophysiology of emotion. In N.S. Greenfield & R.A. Sternbach (Eds.), Handbook of Psychophysiology. New York: Holt, Rinehart and Winston, 1972, 623-643.

Leigh, D. & Marley, E. Bronchial asthma: A genetic population and psychiatric study. London: Pergamon Press, 1967.

Leigh, H. & Reiser, M.F. Major trends in psychosomatic medicine. Annals of Medicine, 1977, 87, 233-239.

Lerro, F.A., Hurnyak, M.M., & Patterson, C. Successful use of thermal biofeedback in severe adult asthma. American Journal of Psychiatry, 1980, 137, 735-736.

Lewis, H. & Lewis, M. Psychosomatics. New York: The Viking Press, 1972.

Matus, I. Assessing the nature and clinical significance of psychological contributions to childhood asthma. American Journal of Orthopsychiatry, 1981, 51 (2), 327-341.

Miklich, D.R. Health psychology practice with asthmatics. Professional Psychology, 1979, 10 (4), 58-588.

Minuchin, S., Baker, L., Rosman, B., Liebman, R., Milman, L., & Todd, T. A conceptual model of psychosomatic illness in children. Archives of General Psychiatry, 1975, 32, 1031-1038.

Mook, J. & van der Ploeg, H.M. Speech activity and respiratory function in asthmatics. Psychotherapy and Psychosomatics, 1980, 33 (3), 167-177.

Moore, N. Behavior therapy in bronchial asthma: A controlled study. Journal of Psychosomatic Research, 1965, 9, 257-276.

Moorefield, C.W. The use of hypnosis and behavior therapy in asthma. American Journal of Clinical Hypnosis, 1970, 13, 162-168.

Morris, J.F., Koski, A. & Johnson, L.C. Spirometer standards for healthy nonsmoking adults. American Review of Respiratory Disease, 1971, 103, 57-67.

Olton, D.S. & Noonberg, A.R. Biofeedback: Clinical applications in behavioral medicine. New Jersey: Prentice-Hall Inc., 1980.

Paul, G.L. Behavior modification research: Design and tactics. In C. M. Franks (Ed.), Behavior Therapy: Appraisal and Status. New York: McGraw Hill, 1970.

Pepys, J. & Davies, R.J. Allergy. In T.J.H. Clark & S. Godrey (Eds.), Asthma. Philadelphia: W.B. Saunders Company, 1977.

Phillip, R.L., Wilde, G.J.S. & Day, J.H. Suggestion and relaxation in asthmatics. Journal of Psychosomatic Research, 1972, 16, 193-204.

Piazza, E.V. Comprehensive therapy of chronic asthma on a psychosomatic unit. Adolescence, 1966 (61), 139-144.

Pinkerton, P. Correlating physiologic with psychodynamic data in the study and management of childhood asthma. Journal of Psychosomatic Research, 1967, 11, 11-25.

Plutchik, R., Williams, H., Jerrett, I., Karasn, T. & Kane, C. Emotions, personality and life stresses in asthma. Journal of Psychosomatic Research, 1978, 22, 425-431.

Purcell, K., Brady, K., Chai, H. & Muser, J. The effects of asthma in children of experimental separation from family. Psychosomatic Medicine, 1969, 31, 144-164.

Purcell, K. & Weiss, J.H. Asthma. In C.G. Costello (Ed.), Symptoms of psychopathology: A handbook. New York: Wiley, 1970.

Rathus, S.A. Motoric, autonomic, and cognitive reciprocal inhibition of a case of hysterical bronchial asthma. Adolescence, 1973, 8, 29-32.

Rees, L. The importance of psychological, allergice, and infective factors in childhood asthma. Journal of Psychosomatic Research, 1964, 7, 253-262.

Russell, R.K. & Sipich, J.F. Cue-controlled relaxation in the treatment of test anxiety. Journal of Behavior Therapy and Experimental Psychiatry, 1973, 4, 47-49.

Rimm, D.C. & Masters, J.C. Behavior therapy: Techniques and empirical findings. Second Edition. New York: Academic Press, 1979.

Ruppel, G. Manual of pulmonary function testing (2nd Edition). St. Louis: The C.V. Mosby Company, 1979.

Scadding, J.G. Definition and clinical categories of asthma. In T.J.H. Clark & S. Godfrey (Eds.), Asthma. Philadelphia: W.B. Saunders Company, 1977, 1-10.

Scadding, J.G. Definition and clinical categorization. In E.B. Weiss & M.S. Segal (Eds.), Bronchial Asthma: Mechanisms and Therapeutics. Boston: Little, Brown and Company, 1976, 19-31.

Scherr, M.S., Crawford, P.L., Sergent, C.B., & Scherr, C.A. Effect of biofeedback techniques on chronic asthma in a summer camp environment. Annals of Allergy, 1975, 35, 289-295.

Schwobel, G. Psychosomatische therapie des asthma bronchiale. Anzmein Forsch, 1948, 24, 481-488.

Shoemaker, D. In D.C. Rimm & J.C. Masters (Eds.), Behavior therapy: Techniques and empirical findings (2nd Edition). New York: Academic Press, 1979.

Sergeant, H.G.S. & Yorkston, N.J. Verbal desensitization in the treatment of bronchial asthma. Lancet, 1969, 2, 1321-1323.

Sichel, J.P. Chevouche-Baldanf, A., & Baldanf, E. The Schultz method of relaxation in childhood asthma. Revue de Neuropsychiatrie Infantile, 1973, 21, 529-541.

Sirota, A.D. & Mahoney, J.J. Relaxing on cue: The self regulation of asthma. Journal of Behavior Therapy and Experimental Psychiatry, 1974, 5, 65-66.

Spevack, M. Behavior therapy treatment of bronchial asthma: A critical review. Canadian Psychological Review, 1978, 19 (4), 321-327.

Staudenmayer, H., Kinsman, R.A., Dirks, J.F., Spector, S.L., & Wangaard, C. Medical outcome in asthmatic patients: Effects of airways hyper-reactivity and symptom focused anxiety. Psychosomatic Medicine, 1979, 41 (2), 109-118.

Staudenmayer, H., Kinsman, R.A., & Jones, N. Attitudes towards repiratory illness and hospitalization in asthma: Relationships with personality, symptomatology and treatment response. Jouranl of Nervous and Mental Disease, 1978, 166 (9), 624-634.

Teiramaa, E. Psychosocial and psychic factors in the course of asthma. Journal of Psychosomatic Research, 1978a, 22, 121-125.

Teiramaa, E. Psychic disturbances and severity of asthma. Journal of Psychosomatic Research, 1978b, 22, 401-408.

Teiramaa, R. Psychic disturbances and duration of asthma. Journal of Psychosomatic Research, 1978c, 22, 127-132.

Teiramaa, E. Asthma, psychic disturbances and family history of atopic disorders. Journal of Psychosomatic Research, 1979a, 23 (3), 209-217.

Teiramaa, E. Psychic factors and the inception of asthma. Journal of Psychosomatic Research, 1979b, 23 (4), 253-262.

Teiramaa, E. Psychosocial and psychic factors and age of onset of asthma. Journal of Psychosomatic Research, 1979, 23 (1), 27-37.

Walton, D. The application of learning theory to the treatment of a case of bronchial asthma. In Eysenck, H.J. (Ed.), Behavior Therapy and the Neuroses. Oxford: Pergamon Press, 1969.

Weiss, J.H. A practical approach to the emotions and asthma. American Lung Association Bulletin, 1981, 1-4.

Wenger, M.A., Jones, F.N., & Jones, M.H. Physiological psychology. New York: Holt, Rinehart and Winston, 1956.

Williams, M.H. Asthma: A practical guide for physicians. New York: American Lung Association, 1973.

Wilson, A.F., Honsberger, R., Chia, J.T., & Novey, H.S. Transcendental medication and asthma. Respiration, 1975, 32, 74-80.

Wolpe, J. The practice of behavior therapy (2nd ed.). Oxford: Pergamon Press, 1973.

Wolpe, J. & Lazarus, A. Behavior therapy techniques: A guide to the treatment of neuroses. Oxford: Pergamon Press, 1966.

Yorkston, N.J., McHugh, R.B., Brady, R., Serber, M., & Sergeant, H.G.S. Verbal desensitization in bronchial asthma. Journal of Psychosomatic Research, 1974, 18, 371-376.

Zinet, G.D., Dirks, J.F., & Kinsman, R.A. Some aspects of the experience of asthma: Personality style dependent appraisal. Journal of Asthma Research, 1979, 16 (4), 125-130.

Footnote

1 Morris et al., 1971 have developed a technique by which one can determine normal or expected respiratory values based upon a patient's age, sex and height. If obtained, or actual values are less than expected levels, pulmonary demise has occured .

APPENDIX A

Asthma Symptom Checklist
(from Kinsman et al., 1973)

Asthma Symptom Checklist

Name_____ Date_____

Age_____ Sex_____ Patient Number_____

The following is a list of things sometimes associated with asthma attacks. For each item, please circle the number which indicates whether it Never (1), Almost Never (2), Sometimes (3), Almost Always (4), or Always (5) applies to your asthma. REMEMBER: Respond to each item of this list in regard to its ability to describe how you feel during an asthma attack.

	Never	Almost Never	Sometimes	Almost Always	Always
1. Cramps.....	1	2	3	4	5
2. Panting.....	1	2	3	4	5
3. Numb.....	1	2	3	4	5
4. Mucous Congestion.....	1	2	3	4	5
5. Cranky.....	1	2	3	4	5
6. Irritable.....	1	2	3	4	5
7. Hard to Breathe.....	1	2	3	4	5
8. Headache.....	1	2	3	4	5
9. Edgy.....	1	2	3	4	5
10. Frightened.....	1	2	3	4	5
11. Uncomfortable.....	1	2	3	4	5
12. Short of Breath.....	1	2	3	4	5
13. Chest Congestion.....	1	2	3	4	5
14. Afraid of Being Left Alone.	1	2	3	4	5
15. Afraid of Dying.....	1	2	3	4	5
16. Frustrated with Things.....	1	2	3	4	5
17. Heart Pounding.....	1	2	3	4	5
18. Dizzy.....	1	2	3	4	5
19. Rapid Breathing.....	1	2	3	4	5

		Never	Almost Never	Sometimes	Almost Always	Always
20.	Worn Out.....	1	2	3	4	5
21.	Panicky.....	1	2	3	4	5
22.	Weak.....	1	2	3	4	5
23.	Pins and Needles Feelings..	1	2	3	4	5
24.	Don't Care About Things....	1	2	3	4	5
25.	Feel Isolated.....	1	2	3	4	5
26.	Wheezy.....	1	2	3	4	5
27.	Worried About the Attack...	1	2	3	4	5
28.	Angry.....	1	2	3	4	5
29.	Tingly in Spots.....	1	2	3	4	5
30.	Chest Tightening.....	1	2	3	4	5
31.	Tired.....	1	2	3	4	5
32.	Scared.....	1	2	3	4	5
33.	Furious.....	1	2	3	4	5
34.	Nervous.....	1	2	3	4	5
35.	Fatigued.....	1	2	3	4	5
36.	Feel Helpless.....	1	2	3	4	5
37.	Chest Filling Up.....	1	2	3	4	5
38.	Short Tempered.....	1	2	3	4	5
39.	Lonely.....	1	2	3	4	5
40.	Worried.....	1	2	3	4	5
41.	Chest Pain.....	1	2	3	4	5
42.	Exhausted.....	1	2	3	4	5
43.	Mad at the World.....	1	2	3	4	5
44.	Coughing.....	1	2	3	4	5

		Never	Almost Never	Sometimes	Almost Always	Always
45.	No Energy.....	1	2	3	4	5
46.	Unhappy.....	1	2	3	4	5
47.	Worried About Myself.....	1	2	3	4	5
48.	Concerned About Asthma.....	1	2	3	4	5
49.	Concerned in General.....	1	2	3	4	5
50.	Feel Ignored.....	1	2	3	4	5

APPENDIX B

20 P-F (Panic-Fear Scale)
(from Dirks et al., 1978)

NAME: _____

SEX: _____

20 P-F

If a statement is TRUE or MOSTLY TRUE, as applied to you, circle the T before the statement. If a statement is FALSE or NOT USUALLY TRUE, as applied to you, circle the F before the statement.

T F 1. At times I have fits of laughing and crying that I cannot control.

T F 2. No one seems to understand me.

T F 3. I have never been in trouble because of my sex behavior.

T F 4. My feelings are not easily hurt.

T F 5. I would like to be a singer.

T F 6. The sight of blood neither frightens me nor makes me sick.

T F 7. Often I can't understand why I have been so cross and grouchy.

T F 8. I do not always tell the truth.

T F 9. I frequently have to fight against showing that I am bashful.

T F 10. I am worried about sex matters.

T F 11. My hands have not become clumsy or awkward.

T F 12. I am an important person.

T F 13. I frequently find myself worrying about something.

T F 14. I am more sensitive than most other people.

T F 15. I am not afraid of fire.

T F 16. I am not unusually self-conscious.

T F 17. I would like to be a soldier.

T F 18. I have had no difficulty starting or holding my urine.

T F 19. I feel like giving up quickly when things go wrong.

T F 20. I sometimes feel that I am about to go to pieces.

20 P-F Answer Key

Below are the answers to the 20 P-F items which are scored to obtain a panic-fear personality score.

1. True
2. Filler
3. False
4. False
5. Filler
6. False
7. True
8. Filler
9. True
10. True
11. False
12. Filler
13. True
14. True
15. False
16. False
17. Filler
18. False
19. True
20. True

APPENDIX C

Asthma Survey Schedule (AmSS)
(from Cautela, 1981)

Date _____

Title of survey schedule _____

Name _____

Address _____

Phone _____

Age _____

Sex _____

Grade (if student) _____

Occupation (if employed) _____

Marital status _____

ASTHMA SURVEY SCHEDULE (AmSS)

Purpose: To help the therapist determine physiological and psychological antecedents and consequences that may affect asthmatic episodes. The schedule has been useful in pinpointing the behavior during the episodes that can be modified by behavioral procedures, as well as the antecedents and consequences that can be manipulated to reduce asthma behavior. It also has helped clients to recognize the many factors that influence asthmatic episodes.

Number of questions: 39

Questions	Topic
3–5	Medication
6	Nonmedical intervention
7–11	Related illnesses
12, 13	History of the illness
14	Family history
15	Frequency of episodes
16	Warning signs of episodes
17	Symptoms during episodes
18	Duration of episodes
19–21	Client behaviors during and after episodes
22–34	Etiological factors
35	Reactions of others to episodes
36, 37	How the illness interferes with the client's life
38, 39	Client reactions to the physician

ASTHMA SURVEY SCHEDULE (AmSS)

1. Physician's name _____
   Address _____
   Phone _____

2. What is your height? _____ your weight? _____

3. What medication have you previously taken for your asthma?

Medication	Dosage	Effectiveness

4. What medication are you currently taking for your asthma?

Medication	Dosage	Effectiveness

5. What other medication are you currently taking?

Medication	Dosage	Effectiveness

6. What do you do to reduce the frequency of your asthmatic episodes besides taking medication?
   _____
   _____
   What are the effects? _____
   _____

7. What other allergies do you have? _____

8. Check which of the following medical problems you have had:
   a. Urticaria _____
   b. High blood pressure _____
   c. Pneumonia _____
   d. Bronchitis _____
   e. Cardiac problems _____
   f. Sinus problems _____
   g. Eczema _____

9. What other illnesses do you presently have? _____
   _____

10. How much of the time do you have colds?
    Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

11. How much of the time do you have headaches?
    Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____
    In what part of your head is your ache usually located? _____
    _____

12. When did you have your last complete physical examination? _____
What were the results? _____

13. When did you have your first asthmatic episode? _____

14. Does anyone in your family have asthma? Yes _____ No _____ If so, identify whom. _____

15. How frequent are your asthmatic episodes? Per day _____ Per week _____ Per month _____

16. Do you have any warning signs before your asthmatic episodes? Yes _____ No _____ If so, what are they? _____

17. Check the degree to which each of the following symptoms occurs during an asthmatic episode:

a. Tightness in the chest
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Wheezing
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Feeling faint
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Coughing
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. Coughing up or spitting mucous
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. Sweating
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

g. Pain
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

h. Fear
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

i. Itching
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

j. Rash or hives
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

k. Loss of consciousness
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

l. Rapid breathing
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

18. How long does an asthmatic episode usually last? _____

19. While you are having an asthmatic episode, do you try to stop it or reduce its severity?
Yes _____ No _____ If so, please describe what you do. _____

20. What do you do during an asthmatic episode? _____

_____

_____

21. What do you do after an asthmatic episode? _____

_____

_____

22. Check the degree to which each of the following factors appears to trigger asthmatic episodes:

a. Changes in temperature

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Amount of humidity

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Pollen

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Animals

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. Dust

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. Insecticide

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

g. Smoke

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

h. Paints

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

i. Anger

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

j. Tension

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

k. Fatigue

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

l. Stress

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

m. Fear

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

n. Overactivity

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

23. Indicate how likely it is that an asthmatic episode will occur during each of the following seasons:

a. Summer

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Winter

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Spring

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Fall

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

24. Check the degree to which you have asthmatic episodes in the following places:

a. Home

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Work

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. School

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. In a car

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. In the city

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. In the country

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

g. Other (specify) _____

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

25 Check how often your asthmatic episodes occur at each of these times:

a. Morning

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Afternoon

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Evening

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Night

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. While sleeping

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

26. Do you have any pets? Yes _____ No _____ If so, what animals do you have and where do you keep them? _____

27. Describe your work environment. _____

_____

_____

28. How much of the time do you take aspirin?

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

29. Does aspirin seem to make your asthma worse? Yes _____ No _____ If so, please explain. _____

_____

30. Do you smoke? Yes _____ No _____ If so, what do you smoke and how much per day? _____

_____

How long have you smoked? _____

31. Did you ever smoke? Yes _____ No _____ If so, what did you smoke, how much per day, and when did you stop? _____

32. Indicate the amount of anxiety you feel in each of the following situations:

a. Being introduced to a stranger
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Giving your opinion in front of a group
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Speaking up to loved ones when an injustice is done
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Speaking up to friends when an injustice is done
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. Speaking up to strangers when an injustice is done
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. Speaking up to relatives when an injustice is done
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

g. Speaking up to service people, such as store clerks, when an injustice is done
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

h. Socializing at a party
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

i. Initiating conversation with a stranger
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

j. Receiving a compliment
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

k. Being criticized
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

33. Check the degree to which you would describe yourself in each of the following ways:

a. Very relaxed
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Relaxed
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Fairly relaxed
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. A little nervous
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. Nervous
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. Very nervous
Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

34. Rate how much you participate in each of these activities:

a. Walking

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Jogging or running

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Calisthenics

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Lifting

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. Pulling

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. Pushing

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

g. Bicycling

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

h. Walking up and down stairs

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

35. Rate how often the members of your family display each of the following reactions to your illness:

a. Showing sympathy

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Wanting to be with you more

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Wanting to be with you less

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Seeing you as less worthwhile

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. Finding you a burden

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. Admiring your courage

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

g. Finding you annoying

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

h. Giving you more attention than before your illness

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

i. Giving you less attention than before your illness

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

j. Resenting you

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

k. Appreciating you more

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

36. How does your asthma interfere with your life? _____

37. If you no longer had asthma, how would your life change? _____

38. Check the degree to which your physician acts in each of these ways:

a. Treats you with respect

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

b. Answers your questions readily

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

c. Gives you adequate information in a clear manner

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

d. Makes himself or herself available when you need him or her (by phone or in person)

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

e. Behaves in a friendly manner toward you

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

f. Considers your emotional needs

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

g. Spends enough time with you during office visits

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

h. Gives you the best medical treatment available

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

39. How closely do you follow your physician's instructions for taking medication?

Not at all _____ A little _____ A fair amount _____ Much _____ Very much _____

APPENDIX D

Physician's Severity Rating
(from Plutchik et al., 1978)

Physician's Severity Rating

Please make an overall rating of the degree of severity of _____ (patient's name) asthma based upon the medication(s) you are currently prescribing. Place a check ( ) next to the appropriate rating.

_____ 1. Mild, episodic asthma, No need for steroids. May take oral bronchodilator, occasional use of spray.

_____ 2. Requires continuous therapy with bronchodilator, no steroids.

_____ 3. Requires steroids intermittently for short periods.

_____ 4. Requires steroids, most, not all of the time.

_____ 5. Needs steroids all the time but well controlled.

_____ 6. Despite steroids gets asthma requiring more intensive therapy - higher doses, ER visits, hospital.

_____ 7. On full doses of all medication, still has severe asthma much of the time.

_____ 8. Same as above but disabled most of the time.

_____ 9. Constantly disabled by asthma despite all therapy.

APPENDIX E

Daily Assessment Form (DAF)

Daily Assessment Form (DAF)

Instructions: Each time you experience an asthma attack (from mild onset symptoms to severely impaired breathing), please record the following information at the earliest opportunity. Fill out one DAF each day, even if you have no attacks.

Attack Number 1

1) How long did the attack last _____
2) How severe was it (1:Mild; 10:Severe) _____

Attack Number 2

1) How long did the attack last _____
2) How severe was it (1:Mild; 10:Severe) _____

Attack Number 3

1) How long did the attack last _____
2) How severe was it (1:Mild; 10:Severe) _____

Please provide the above information for each attack you experience. In addition, please provide the following information:

Date: _____

Total Number of attacks today: _____

Types of Medication taken today: _____

Amount of each medication: _____

_____

APPENDIX F

24-Hour History

24-Hour History

Date: _____

Sub. No: _____

Cond: _____

Age: _____ Height: _____ Weight: _____

One's performance on the spirometer on any one given day might vary as a function of many factors. In order to interpret your test scores accurately, we would like to have some information regarding your behavior and activities during the past 24 hour period. Please answer the following questions as accurately as possible by placing a circle around the appropriate number of term. This information will be kept confidential.

1. How many hours of sleep did you have last night? (circle)

   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

2. Have you exercised within the past 4 hours? YES NO
   If the answer is YES, please place a circle around one of the following

   LIGHT MODERATE VIGOROUS EXTREMELY VIGOROUS

3. Have you exercised within the past 24 hours? YES NO
   If the answer is YES, please place a circle around one of the following:

   LIGHT MODERATE VIGOROUS EXTREMELY VIGOROUS

4. How many hours since your last meal or snack?

   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

   16 17 18 19 20 21 22 23 24

5. If you have eaten within the past 4 hours, please circle the amount of food consumed:

   SMALL MEDIUM LARGE

6. If you smoke, how long has it been since you last smoked? (in hours)

   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

   16 17 18 19 20 21 22 23 24

7. How many times per day do you smoke?

8. Have you taken any medications within the past 24 hours? YES NO
If YES, what medications?

9. Have you done anything unusual within the past 24 hour period which you feel might affect your performance on the spirometer? YES NO
If YES, please explain in the space below

10. Have you consumed any beverages within the last 24 hours? YES NO The past 12 hours? YES NO
If YES, what and how much did you consume?

11. Relative to your normal state (No 4), please mark a point on the seven point scale below to indicate how you feel.

1 2 3 4 5 6 7

Depressed sick — NORMAL — Alert healthy

APPENDIX G

Explanation of Pulmonary Assessment Procedure

Explanation of Pulmonary Assessment Procedure

Examiner Statement: This assessment we are about to do is a very simple one. All you are required to do is to inhale as deeply as possible and to exhale this breath as rapidly as you can into this tube. We will be repeating this three times. Please try your hardest on each attempt.

Steps

1. Adjust the tube so that it is at the same level as your mouth.
2. Inhale as deeply as you can.
3. As soon as you reach the end of this inhalation, exhale this breath as rapidly and as fully as you can into the tube.
4. Rest for a couple of minutes.
5. Now let's repeat the same steps.

APPENDIX H

Informed Consent

Informed Consent

I _____ agree to participate in this re-
(participant's name)
search program involving a treatment strategy which may prove helpful to myself, and others, in attempting to control our asthma. No guarantees regarding potential improvement have been given to me, however.

The following information involved in this program has been provided to me and has been explained to my satisfaction. All my questions have also been answered satisfactorily:

1) Time Involved: Approximately 18 weeks. This is broken down in the following manner:

   A) Pretreatment Assessments: one appointment which should take less than one hour.

   B) Treatment sessions: one session per week for five weeks. Each session will be one hour to one hour and a half in length.

   C) Follow-up Assessments: One appointment approximately one month after the completion of the treatment program. An additional appointment three months after the completion of the program (i.e., two months after the initial follow-up). Each appointment should be approximately one hour in length.

   (Note: The above services will be provided at no cost to participants).

2) Treatment Program - Relaxation Training: This training is designed to teach me to relax in situations which have previously caused me to get upset or nervous. One portion of this training will involve learning to relax my muscles with a series of exercises. Any specific exercise which causes me discomfort will be eliminated. These exercises simply involve tensing and relaxing various muscle groups throughout the body. Another segment of this training involves learning to focus on some scene which I find to be pleasant (e.g., the seashore). A final segment involves learning to breath in an even/rhythmic fashion and telling myself to "relax" each time I exhale. I understand that I will be taught these techniques in a group of 6 to 10 other individuals. In addition, I understand that I will be required to practice my relaxation exercises one-half hour per day at home.

3) Assessment Devices

   a) Questionnaires - there will be a variety of questionnaires, some requesting personal information, which I will be required to complete. I also understand that there are some forms which I will have to complete on a daily basis throughout this 18 week project.

b) Pulmonary Function - this procedure will involve taking as deep an inhalation as possible and exhaling it as rapidly and fully as possible into a tube. The steps of this procedure have been outlined to me and I have been given a copy of these steps in writing (Appendix G). I understand that I will be asked not to eat anything or drink any fluids except water or juices for three hours before each assessment. In addition, the procedure itself may cause some slight discomfort, but I understand that the examiner is well-trained and supervised.

c) Physician Ratings - on four occasions throughout the course of this project the physician who is treating me for my asthma will be required to fill out a brief questionnaire. I understand that if there is any cost for his completing this form I will have to pay for it. I also understand that by my signature below I am granting Mr. Marcello and my physician the privilege of discussing my case, either through the mail or by personal/telephone contacts, as it pertains to my involvement in this project only.

I understand that my participation in this program poses no risks to my health and well-being. At no time will I be asked not to take my asthma medication by these investigators. Such decisions will be made by my physician based solely upon my medical condition. I also understand that I will remain under the primary care of my physician during this program and that I will be free to visit with him/her as often as deemed necessary by myself and my physician.

I also understand that my confidentiality will be guarded at all times during and after my participation in this program. I understand that all questionnaires and other data will be identified by code numbers. My name will not be utilized in any verbal or written account of this program.

I understand that it is my right to withdraw my consent for participation in this program at any time. I will be free to exercise this right as I see fit.

I have read the above and I understand its contents and agree to its conditions.

_____
Participant's Signature

_____
Witness

_____
Date

_____
Guardian's Signature if participant is a minor

APPENDIX I

RELAXATION TRAINING MANUAL

(Adapted from: Russell and Sipich, 1973; Shoemaker, 1979; Sirota and Mahoney, 1974; Wolpe and Lazarus, 1966)

Relaxation Training Manual

Part I

MUSCLE RELAXATION EXERCISES

Introduction

The basic idea of these exercises is to teach you how to relax fully and completely. It has been found that an effective method of achieving relaxation is to tense the various muscles and muscle groups of your body as tightly as you can, holding and studying the tension for a few moments, and then releasing the tension and noticing the difference. The idea is to methodically concentrate on the difference between tension and relaxation. While tensing any specified area of your body, the rest of your body should remain as relaxed as possible. As you progress through these exercises, you will learn to enjoy the relaxation more and more as it becomes deeper and more complete. Throughout these exercises, you will notice a series of three dots (...). These dots indicate periods where you are to pause for five or ten seconds and concentrate on the sensations you are feeling at that moment.

General Loosening Up

These exercises are designed to loosen up your major muscles, and will take about two or three minutes. Begin by standing up and stretching your hands over your head as high as you can, stretching all of the muscles from your finger tips down to your toes. Hold this tension for a few moments ... then relax ... Repeat this exercise several times. Now stretch your arms out sideways as far as you can and tense them. Hold this tension for a few moments ... then relax ... Repeat this exercise several times. Now bend forward tensing the muscles along your back and legs ... study the tension for a few moments ... then relax and notice the difference ... Repeat this exercise several times. Next lightly shake your hands and arms for a few seconds, relaxing all the muscles that you can. Then be seated, preferably in a comfortable, reclined lounge chair, and carry out the following exercises:

Development of Relaxation in the Hands, Arms, and Shoulders

These exercises will be directed toward relaxing the muscles in your hands, arms, and shoulders. They will take approximately four to six minutes to complete.

You should at this point already be seated with both feet comfortably extended out in front of you, your arms and hands resting along the arm of the chair, and your head and neck in a relaxed, resting position. Relax like this for a few moments ... Now, make your right hand into a tight fist, clench your fist tight, as tightly as you can and build up the tension in your hand and forearm ... study this tension for a few moments ... now relax and notice the difference ... Once more, clench your right fist as tightly as you can, build up the tension, study it... now relax and notice the difference ... Now clench your left hand and make it into a tight fist. Make the fist tighter and tighter, build up the tension and study it for a few moments ... Now relax and notice the difference ... Once more, make your left hand into a tight fist, build up the tension in your hand and forearm tighter and tighter, study this this tension for a few moments ... and now relax and notice the difference ... Notice how relaxed your hands are and how much more pleasant the relaxation is compared to tension. Concentrate on relaxing all over for a few moments ... Next, bend your right elbow, making your right hand into a fist and tensing your forearm and upper arm as tight as you can, build up this tension tighter and tighter, study it for a few moments ... Now relax ... straighten your arm and let the tension flow out... Notice the difference between the tension and relaxation ... Enjoy the relaxation for a few moments ... Now, once more, bend your right elbow, making your right hand into a fist and building up the tension in your hand, forearm, and upper arm. Build up this tension and study it for a few moments ... Now relax ... straighten out your arm and hand and let all the tension flow out. Concentrate on studying the difference between relaxation and tension ... Now, breathe normally and rest for a few moments ... Next, bend your left elbow making your left hand into a fist and tightly tense your forearm and upper arm, build up the tension in your upper arm, study it ... now relax and notice the difference ... Notice how good the absence of tension feels ... Enjoy this relaxation for a few moments ... Now once again, bend your left elbow very hard making your left hand into a tight fist and your upper arm muscle into a tight ball, build up the tension as much as you can ... study the tension ... now relax and notice the difference ... Let all the tension flow out of your muscles and concentrate on becoming as relaxed as you can... Just concentrate on relaxing as completely as you can, and remain in this position as the instructions for the next relaxation exercises begin.

Relaxation of Upper Back, Chest, Stomach, and Lower Back

These exercises will last four to six minutes. Keeping the rest of your body relaxed, tense the muscles in your upper back area by raising your shoulders and shrugging them back and up; tense them tight, build up the tension ... study it ... Now relax. Let your shoulders fall down and relax as completely as you can ... Notice all the tension flowing out of your upper back area ... Let yourself become more and more relaxed as the relaxation spreads throughout your entire body ... Now once again tense the muscles in your upper back area by shrugging your shoulders up and back, build up the tension ... Study it ... Now relax. Let your shoulders fall, and, as they do, let all the tension flow out of your body ... Let yourself become more and more relaxed ... Concentrate

on reducing even the slighest bit of tension ... Continue to relax and enjoy this feeling for a few moments.

Now, as you are relaxing, breathe in deeply, filling your lungs as fully as you can and hold it for a moment ... Now, breathe out slowly and notice the increasing relaxation ... Breathe normally for a few seconds while concentrating on relaxing more ... Breathe in deeply and again completely fill your lungs; then hold your breath for a few moments ... Now exhale and slowling permit the air to leave your lungs, concentrate on experiencing the increasing relaxation as you slowly exhale ... Breathe normally for a while, letting yourself become more and more relaxed ... Enjoy this spreading relaxation as you breathe in and out ... Now once again breathe in deeply, fill your lungs, and hold your breath for a few moments. Study the sensation ... Now exhale slowly, and concentrate on the pleasant experiences as you do ... Breathe normally again for a while, each time letting yourself becomre more and more relaxed ... Once more breathe in deeply and fill your lungs to capacity; hold your breath for a few moments. Study the tension ... Now exhale slowly, concentrating on becoming more and more relaxed ... Let this relaxation spread throughout your entire body ... Your upper and lower back, shoulders, neck, face, chest, and arms are all becoming more and more relaxed as you breathe... As you continue breathing, concentrate on becoming more and more relaxed ...

As the relaxation goes deeper and deeper, center your attention on your stomach and abdominal area. Pull in your stomach and make it and your entire abdominal area as tight as you can, build up this tension, and study it ... Now relax and let all the tension flow out of these muscles ... Notice how relaxed and loose your muscles are ... Let yourself become more and more relaxed ... Once again pull in your stomach and make your abdominal muscles as tight as you can, build up this tension, study it ... Now release the tension and notice the difference ... once more pull in your stomach and make your abdominal muscles as tight as you can. Study this tension for a few moments ... Now relax, releasing all of the tension in your stomach and abdominal muscles ... Continue relaxing for a few moments ... Next inhale deeply and, pushing your diaphragm down, extend your stomach and tense your abdominal muscles as tight as you can. Study this tension ... Now exhale and relax, releasing all the tension from your stomach and abdominal muscles ... Enjoy this relaxation for a few moments ... Once more, inhale deeply and pushing your diaphragm down, extend your stomach and tense your abdominal muscles as tightly as you can, study this tension ... Now exhale and relax, releasing all the tension from your stomach and abdominal muscles ... Enjoy the ever-decreasing tension ... Continue breathing in and out for a while, concentrating on becoming more and more relaxed ... Let all the tension flow out of the muscles in your abdominal area as well as in the rest of your body ... As your muscles become more and more relaxed, you feel warm and somewhat sleepy ... Your eyelids are becoming heavier and it is hard to keep them open.

Relaxation Exercises for the Lower Back, Hips, Thighs, and Calves

These exercises will last approximately four to six minutes. As your relaxation continues, pay attention to your lower back. First arch your lower back, and tense the muscles there as tightly as you can, build up the tension, study it ... Now, relax and notice the difference ... Concentrate on relaxing your lower back as completely as you can ... Make your entire body more and more relaxed ... Deeper and deeper ... Once again, arch up your lower back and tense the muscles there as tightly as you can, study this tension for a few moments ... Now relax and notice the difference ... Next tense the muscles in your buttocks, thighs, hips, legs, and calves by flexing your buttocks as tightly as you can while at the same time pressing down on the heels of your feet, exerting as much pressure as you can ... Build up this tension ... Study it ... Now, relax and notice the difference ... Concentrate on relaxing all of your muscles, deeper and deeper ... Once again flex your buttocks and press down hard on your heels, build up the tension ... Study it ... Now, relax and notice the difference ... Enjoy this relaxation for a few moments ... Next while resting the heels of your feet, point your toes towards your head and tense all the muscles in your feet, ankles, and lower legs, build up this tension ... Study it ... Now relax and once more notice the difference, notice how good the relaxation feels ... Once more point your toes towards your head and tense all of the muscles in your feet, ankles, and lower legs, build up this tension. Study it ... now relax and notice the difference ... Notice how soothing the relaxation is ... Let this relaxation spread throughout your body. Enjoy this relaxation for a while.

Breathing Instructions

Continue to rest and relax as you go through this set of instructions. These instructions are intended to enhance and intensify the general overall state of deep muscle relaxation already achieved. They will last approximately two to six minutes. By now all of your muscles should be fairly well relaxed. Your eyelids feel heavy, your arms feel heavy, and you feel a warm sensation in all parts of your body along with a desire to fall asleep ... Now enhance your relaxation even more by again taking a deep breath, filling your lungs completely and holding this tension for a few moments ... Then relax and slowly exhale ... Notice how relaxing it is as you exhale ... Breathe normally for a while and concentrate on going into a deeper state of relaxation ... Now once again breathe in deeply, fill your lungs to maximum capacity, and hold your breath for a few moments ... Study the tension ... Now exhale slowly and notice the increased relaxation as you do so ... Breathe normally for a while, and concentrate on eliminating any tension anywhere in your body ... As you breathe in and out, you will become more and more relaxed ... The relaxation will go deeper and deeper ... Now once again breathe in deeply and fill your lungs to capacity ... Hold your breath for a few moments and study the tension ... Now relax and notice the increased relaxation... Continue breathing normally for a while and, as you do, you become even more and more relaxed ... Deeper and deeper ... You should now be in a

state of complete relaxation ... Enjoy and appreciate this state of complete relaxation ... Enjoy and appreciate the very warm, pleasant, and comfortable experience of complete relaxation ...

Part II

Positive Imaging

Now that you are feeling very relaxed, I want you to choose a scene which you find to be very pleasant and relaxing. This scene can be anyplace, for example, at the seashore...The important thing is that it is one which you find to be pleasant. Now I want you to picture yourself relaxing in this scene ... Make this scene as vivid and as real as you possibly can ... For example, imagine the white-capped waves rolling in slowly, one by one, and gradually curling and breaking onto the sand ... All the while, continue to breathe regularly and evenly. Picture yourself in <u>your</u> scene for about five minutes.

Part III

Cue-Controlled Relaxing

Continue to picture yourself in your pleasant scene. Continue to breathe normally and evenly. Now I want you to focus on your breathing. "Each time you begin to exhale or let out a breath, say the word "Calm" (or "Relax" or "Let Go") to yourself so that the word will become a cue for deep, deep relaxation (Rimm and Masters, 1979, p. 38)." Now exhale and repeat "Calm" to yourself. Practice this for 2-3 minutes. We have now completed the relaxation exercises. When you are ready, get up and resume your normal activities.

Part IV

Additional Instructions

<u>Relaxation as Coping</u>

Now that you have learned how to relax, begin to use these skills in your everyday life when you notice you are beginning to tense up. In particular, it may be helpful if you use these skills at the first sign of an oncoming asthma attack. The most practical skills to use at such times are: breathing exercises; positive imaging; and cue-controlled relaxing.

<u>Daily Practice</u>

In order that you learn to relax deeply and quickly, I am recommending that you practice these relaxation techniques every day for at least one-half hour. Just before you go to sleep each night might be the most practical time. Don't forget to keep a record of this practice time in your daily log.

APPENDIX J

Relaxation Thermometer

(Adapted from Alexander et al., 1972)

Relaxation Thermometer

Before we begin today's session, I want you to rate yourself on the following scale. Your rating should reflect how relaxed or tense you feel right now:

1	2	3	4	5	6	7	8	9	10
Very Relaxed/ Drowsy				Awake/Alert				Very Tense/ Hyper	

Rating: _____

Now that we have completed today's session, I want you to rate yourself again on the same scale as before. Once again, your rating should reflect how relaxed or tense you feel at this moment:

Rating: _____

Session Number: _____ Patient: _____

APPENDIX K

Daily Practice Log

Daily Practice Log

Each day throughout the course of this program, please record the following information:

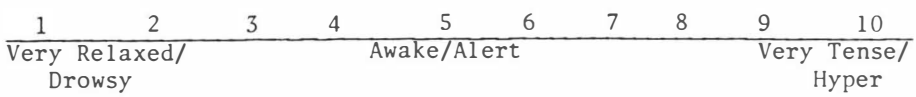
Day	Practice Relaxation	Pre-Practice Rating	Amount of Practice Time(in minutes)	Post Practice Rating
Sunday	Yes ___ No ___	_____	_____	_____
Monday	Yes ___ No ___	_____	_____	_____
Tuesday	Yes ___ No ___	_____	_____	_____
Wednesday	Yes ___ No ___	_____	_____	_____
Thursday	Yes ___ No ___	_____	_____	_____
Friday	Yes ___ No ___	_____	_____	_____
Saturday	Yes ___ No ___	_____	_____	_____

Total: Days Practiced _____ Time _____

Week Number: _____

Patient: _____

Before you begin each practice session, please rate yourself on the following scale. Your rating should reflect how relaxed or tense you feel Right Now:



After you complete your practice session, please rate yourself again on this same scale. Once again, your rating should reflect how relaxed or tense you feel At This Moment.

APPENDIX L

Asthma Type Form

Asthma Type Form

Please indicate which category below (Intrinsic, Extrinsic, Other Asthma Type) is most descriptive of _____ (Patient's Name). In addition, please indicate the criteria upon which this categorization is based.

I. _____ Intrinsic Asthma

Criteria

_____ Negative reaction to antigen skin test

_____ No known relationship between external agents and asthmatic symptoms (with exception of aspirin sensitivity)

_____ Other (please specify) _____

_____

_____

II. _____ Extrinsic Asthma

Criteria

_____ Positive reaction to antigen skin test

_____ Demonstrated relationship between external agents and asthmatic symptoms

_____ Family History of asthma and other atopic disorders

_____ Other (please specify) _____

_____

_____

III. _____ Other asthma type(s) (e.g. exercise induced). Please specify type and criteria:

_____

_____

_____

APPENDIX M

Article Length Draft

Relaxation Therapy as an Adjunct Strategy for the Treatment of Bronchial Asthma: An Examination of Pertinent Psychological and Illness Variables

Robert Joseph Marcello

Virginia Commonwealth University

Running Head: Relaxation Therapy for Asthma

Abstract

Bronchial asthma is a heterogeneous and complex disorder with multiple etiological and precipitating factors. Relaxation Therapy (and its variants) has been employed successfully as an adjunct treatment for this disorder. Recent studies have suggested, however, that the utility of this technique may be limited by: asthma type; asthma severity; personality variables; and relaxation type. The objectives of the current investigation were to: 1) reconfirm the utility of relaxation therapy for treating asthma; 2) examine the degree to which asthma severity and panic-fear personality style related to successful outcome. Fifteen asthmatics (primarily extrinsics) of varying severity and panic-fear style were treated with relaxation therapy. Results on self-report, pulmonary function, and physician ratings partially confirmed the utility of relaxation therapy with this population, however, were only suggestive of the predictive ability of severity and panic-fear type. The results are discussed in terms of the necessity of further and larger scale investigations.

Relaxation Therapy as an Adjunct Strategy for the Treatment of Bronchial Asthma: An Examination of Pertinent Psychological and Illness Variables

Asthma is a relatively common disorder which affects approximately one to five percent of the general population (Graham et al., 1967; Williams, 1973). It has been described as a heterogeneous disorder which "defies easy categorization (Dirks et al., 1979, p.71)" because of its: complex pathophysiology (Gold, 1976); wide range of symptom severity (e.g., from a mild wheeze to severe status asthmaticus and possibly death (Williams, 1973); variety of clinical subtypes (e.g.; intrinsic, extrinsic, exercise induced); Scadding, 1977); and diversity of etiological precipitants (e.g.; infection, exercise, allergies, anxiety; Williams, 1973).

Behavior Therapy techniques have been used as adjunct treatments for bronchial asthma for over 20 years (see Walton, 1960). Research has consistently demonstrated the utility of techniques such as: frontalis electromyograph (EMG) biofeedback (Kotses et al., 1976; Kotses et al., 1978; Scherr et al., 1975); progressive muscle relaxation (Alexander, 1972; Alexander et al., 1972): systematic desensitization (Cooper, 1964; Sergeant and Yorkston, 1969): and assertiveness training (Walton, 1960; Hook et al., 1978) for this purpose. Each of these techniques can be considered an arousal reduction strategy which is based upon the rationale that intense emotional arousal can precipitate and exacerbate asthmatic symptoms (Matus, 1981) and the reduction or minimization of such arousal can be

helpful in achieving: decreased frequency, duration and intensity of asthma attacks; decreased medication usage and emergency room visits; and increased respiratory functioning (see Blanchard & Ahles, 1979; Knapp & Wells, 1978; Erskine-Millis & Schonell, 1981; and Spevack, 1978 for excellent reviews of this literature). Despite the substantial evidence in support of the utility of such arousal reduction techniques, recent studies have suggested that this utility may be limited by such variables as: asthma type (Phillip et al., 1972); asthma severity (Davis et al., 1973); panic-fear personality type (Kinsman et al., 1980a); and treatment type (Erskine-Millis and Schonell, 1981).

Asthma Type

Asthmatics are commonly placed into one of several clinical subtypes on the basis of etiological precipitants. The two major subtypes are intrinsic and extrinsic asthma and this distinction is made upon the basis of whether or not external factors (i.e., allergies) can be readily identified as precipitants of asthmatic symptoms (Scadding, 1976).

Thus far, only one study (i.e., Phillip et al., 1972) in the behavioral treatment literature has systematically examined the differential effects of arousal reduction strategies upon asthma subtypes. In this study, 20 nonsevere asthmatics were assigned to the following groups: 1) Intrinsic-Relaxation; 2) Intrinsic-No Relaxation; 3) Extrinsic-Relaxation; 4) Extrinsic-No Relaxation. After five sessions of progressive muscle relaxation training an overall relaxation effect was found for the treatment groups when compared to the no-treatment control groups on a measure of pulmonary function (i.e., Forced Expiratory Volume in one second or FEV_1). Further, the greatest improvements occurred among the intrinsic asthmatics which suggested the potential importance of this variable

as a predictor of successful/unsuccessful response to techniques of this type.

Asthma Severity

Asthmatics can differ widely in terms of the severity of symptoms they experience, and two studies have suggested that only nonsevere asthmatics may respond well to techniques such as relaxation therapy. For example, Davis et al. (1973) categorized 20 asthmatic children (ages 6 through 15) as nonsevere/severe on the basis of whether or not they were currently receiving steriod therapy. Subjects were then assigned to the following groups: 1) Relaxation training only; 2) Relaxation training with EMG feedback; 3) No treatment control. After five 30 minute treatment sessions sessions, both the relaxation only and the relaxation plus EMG feedfack groups improved significantly greater than the control group on a measure of Peak Expiratory Flow Rate (PEFR). It is interesting to note, however, that these results were observed only among the nonsevere asthmatics. On the basis of these findings, Davis et al. suggested that relaxation therapy (with or without EMG feedback) may be of limited utility for severe asthmatics. A major problem with this conclusion, however, is that these authors failed to control for asthma type. If as suggested by Phillip et al. (1972), intrinsics and extrinsics respond differentially to relaxation therapy, it is quite possible that the equivocal results observed among the severe asthmatics were the function of a "wash out effect" as a result of the heterogeneity of the sample. Indeed, these authors commented that:

> "Extreme response variability displayed by members of the severe group accounts for the lack of significant improvement in the group (p. 126)."

Such "extreme variability" is exactly what one would expect from a group composed of different asthma types.

Alexander et al. (1979) also attempted to evaluate the usefulness of relaxation therapy with severe asthmatic children and failed to obtain significant improvements. On the basis of these results, they concluded that the suggestions of Davis et al. (1973) had been confirmed and suggested further that since relaxation theoretically operates via parasympathetic nervous system (PNS) innervation, and that PNS innervation normally results in bronchoconstriction, we shouldn't expect that relaxation would be effective with asthmatics, rather, we should anticipate a worsening of symptoms.

The results of this study can be criticized upon several grounds. First, like Davis et al. (1973), these authors failed to differentiate subjects according to asthma type which could have contributed to their nonsignificant findings. Second, some research has demonstrated that relaxation strategies are difficult to implement successfully with children because of the attention and concentration required (e.g., Hatzenbuehler and Schroeder, 1978). As such, the four sessions of relaxation given to subjects in this study may not have been adequate. Finally, in challenging the theoretical rationale of relaxation therapy these authors have apparently assumed that the bronchoconstriction associated with asthma is caused uniformly by PNS activity. As stated previously, the pathophysiology underlying asthmatic symptomatology is very complex and does not operate in such a straightforward manner (i.e., bronchoconstriction may be a function of: PNS overreactivity; Sympathetic Nervous System (SNS) - beta adrenergic hypoactivity; SNS - alpha adrenergic hyperactivity; Williams, 1973). It may be that relaxation therapy is effective with certain asthmatics because it serves to

minimize physiological arousal which adversely effects SNS - adrenergic receptors.

Panic-Fear Type

Kinsman et al. (1980b) have stated: "Asthmatic patients simply are not a homogeneous psychological group (p.403)" and that the use of arousal reduction strategies may be limited by the psychological heterogeneity of this population. In a series of studies (e.g., Dirks, et al., 1978; Jones et al., 1979; Kinsman et al., 1980a) they have investigated a psychological style upon which asthmatics vary dramatically. They have labelled this the panic-fear personality style.

Panic-fear is measured in terms of symptom vigilance (a "state" variable) and personality (a "trait" variable). These variables can be assessed reliably via the use of the Asthma Symptom Checklist (ASC; Kinsman et al. 1973; Kinsman et al., 1974) and an MMPI subscale (the 20 P-F; Dirks et al., 1977) respectively. According to Kinsman and his associates, a moderate to high level of symptoms vigilance is considered to be adaptive "because it acts like a signal energizing the patient to act" (p. 420) and low levels are considered maladaptive because the patient ignores the severity of symptoms. Regarding the "trait" panic-fear variable, both extremely low and high levels are considered to be maladaptive (i.e., Low P-F patients underreact to severity of symptoms; High P-F patients panic and over-react). Utilizing these two variables, 9 asthma subtypes have been identified each carrying with it different treatment needs and recommendations. For example, Kinsman et al. (1980a) have suggested that arousal reduction strategies are indicated for only 2 of these 9 subgroups; i.e., Moderate-High and High-High; and are contraindicated for patients who measure low on symptom vigilance (i.e., Low-Low; Low-Moderate; Low-High). This is based on the assumption that relaxation in these cases

might serve to decrease an already maladaptive level of symptom vigilance (Kinsman et al., 1980b; Staudemayer et al., 1979).

Treatment Type

One final limitation to the use of relaxation therapy concerns the method by which such relaxation is achieved. Evidence to date has, for the most part, supported the use of a variety of relaxation procedures with asthmatics including: EMG-assisted relaxation (Scherr et al., 1975); progressive muscle relaxation (Alexander, 1972); Transcendental Meditation (Wilson et al., 1975); Autogenic training (Schwobel, 1948); and systematic desensitization (Sergeant and Yorkston, 1969). Erskine-Millis and Schonell (1981), however, challenged this blanket endorsement in a recent review and concluded that only "mental" techniques (e.g., autogenic training) resulted in clinically and statistically significant improvement. A review of the evidence presented in support of this claim suggests that it may be premature to draw this conclusion. In particular, the extreme response variability found in the studies reviewed (e.g., Alexander, 1972; Alexander et al., 1972; Alexander et al., 1979) suggests, rather, the importance of potential treatment by subject-type interaction.

Conclusion and Recommendations

The blanket application of relaxation therapy has been challenged on several grounds, however, no challenge has been strong enough to seriously restrict its usage with asthmatics at this time. For example, asthma type has been suggested as potentially limiting the effectiveness of relaxation therapy, however, only one study has examined this variable to date and further replications are required. Similarly, asthma severity has been suggested as a limiting variable, however, no study

has examined this variable simultaneously with asthma type which precludes the conclusiveness of this suggestion. Panic-fear type has also been suggested as a potentially limiting variable, however, the relationship between this variable and responsiveness to relaxation therapy has yet to be systematically examined. Finally, treatment type has been suggested as a further restriction, however, the reviewers who suggested this restriction failed to adequately account for treatment by subject type interactions. At this point one could conclude that the restrictions suggested above can be accepted as tentative at best and the task of identifying which patients will respond most favorably to which intervention techniques (c.f. Kiesler, 1966; Paul, 1970) has only begun in the asthma treatment literature. The major shortcoming of research in this area thus far appears to be the failure to evaluate two or more of these restrictive variables simultaneously. Thus, pending further and more adequately controlled research of this type, statements concerning the "blanket indictment of anxiety reduction techniques in asthma" and the "indictment of blanket application" (Kinsman et al., 1980b) of such techniques cannot be made conclusively.

Given the importance of the issues and challenges which have been raised by the above authors, such investigations must be implemented if further progress is to be made in this area of the asthma-treatment literature. What appears to be called for, then, are a series of multifactorial evaluations which will examine the following variables (minimally)in a systematic fashion: 1) Intrinsic versus Extrinsic asthma type; 2) Nonsevere versus Severe intensity; 3) Muscular versus Mental Relaxation strategies 4) Panic-Fear asthma subtypes. The present study represents an initial step in this series.

The Present Study

The objectivesof the current investigation were to: 1) reconfirm the utility of relaxation therapy as an adjunct treatment strategy for asthmatics; 2) examine the degree to which asthma severity and panic-fear type were useful as predictors of responsiveness to treatment while controlling for asthma type (i.e., subjects were primarily extrinsics) and treatment type (i.e., relaxation therapy included both muscular and mental components). Several hypotheses were made for each of the stated objectives of this investigation.

First and foremost, it was predicted that all subjects who participated in this program would demonstrate the acquisition of the relaxation skill as indicated by decreased self-ratings of tension/relaxation following all treatment sessions. Assuming the acquisition of this skill, it was also hypothesized that relaxation therapy would effect the following outcomes: 1) Decreased frequency, duration, and intensity of asthma attacks; 2) Decreased medication usage; 3) Improved respiratory functioning; 4) Decreased panic-fear symptom vigilance scores; 5) Decreased panic-fear personality scores. In addition, it was hypothesized that both panic-fear personality type and asthma severity would be significantly related to favorable outcome. Finally, it was hypothesized that compliance to treatment instructions (i.e., as indicated by time spent practicing relaxation training independently) would also be positively related to improvement of asthmatic symptoms.

Method

Subjects

Source. Subjects were volunteers recruited from one of two sources: 1) An adult Allergy Clinic affiliated with the Medical College of Virginia; 2) The caseloads of private physician's who treat asthmatics in the Richmond

Metropolitan Area. A brief description of the project was initially given to patients from either source and persons interested in participating were later contacted directly by the principal investigator. Involvement in this treatment program was coordinated with the primary care physician of each individual. At no time were subjects asked to change their medication regimens by the principal investigator. Any changes in medication made during the period of this study were solely the result of patient-doctor consultations.

Pretreatment Ratings. Subjects who participated in this investigation were rated in terms of asthma type, severity, and panic-fear type prior to treatment according to the following criteria:

A) Asthma Type:

1) Intrinsic:nonreaction to an antigen skin test; no known relationship between external agents and asthmatic symptoms (with the exception of aspirin sensitivity);

2) Extrinsic:positive (i.e., wheal and flare) reaction to an antigen skin test; in absence of such a reaction, a demonstrated relationship between external agents and asthmatic symptoms; family history of asthma or other atopic disorders such as hay fever, rhinitis and eczema;

3) Other:this category was to include either mixed or exercise-induced asthmatics. Mixed asthmatics were defined as those who possessed both intrinsic and extrinsic traits. Exercise-induced asthma is self explanatory.

B) Severity:

1) Severe: rating of at least level 4(i.e., "Requires steroids, most, not all of the time") on the Physician's Severity Rating Scale (PSRS; Plutchik et al., 1978);

2) Nonsevere: Physician's Severity Rating of 3 or less.

C) Panic-Fear Type: Subjects were categorized based upon symptom vigilance and panic-fear personality scores (i.e., ASC and 20 P-F respectively) according to the guidelines suggested by Jones et al. (1979);

1) Symptom Vigilance:
   a) Low-Mean score of less than 2.43;
   b) Moderate-mean score of greater than or equal to 2.43 or less than or equal to 3.29;
   c) High - mean score greater than 3.29.
2) Personality:
   a) Low - raw score less than or equal to 2;
   b) Moderate - raw score between the range of 3 and 8;
   c) High - raw score equal to or greater than 9.

Number. Attempts were made to recruit 40 subjects for this investigation. An initial list of over 50 names of potential participants was obtained from the above sources. Of this total, 50 individuals were contacted and 40 agreed to participate in this program. Of this 40, only 28 attended the pretreatment assessment session and further attrition at various points in the study resulted in a final sample of 15 participants who completed the entire 10-week program.

Description of Final Sample. The final sample was composed of 12 females and 3 males who ranged in age from 15 to 61 years old (M=32.33; S.D.=11.17). Three of the participants were Black and the remaining 12 were White and were rated as follows on the pretreatment variables:

A) Asthma Type - 13 extrinsic asthmatics; 2 mixed asthmatics with dominant extrinsic factors.

B) Asthma Severity - 10 nonsevere and 5 severe (M=3.33,S.D.=1.40).

C) Panic-Fear Type - 1 Low-Moderate; 7 Moderate-Moderate; 2 Moderate-High; 1 High-High

All subjects were being treated with varying types of asthma medication including: Bronchodilators; Antihistamines; and Corticosteroids. Pretreatment performance on the FEV_1/FVC pulmonary function measure suggest that this was a sample of episodic asthmatics since 14 of 15 subjects performed within normal limits (i.e., range of 61.33% to 98.67%; M=85.78%,S.D.=9.58).

Dependent Measures

Self-Report. Four self-report measures were employed in this study and are described below:

1) Relaxation Thermometer (RT) - the RT is a 10 point rating scale ranging from 1 (Very relaxed) to 10 (Extremely tense) which was administered before and after each treatment session.

2) Asthma Symptom Checklist - the ASC is a 50 item questionnaire which measures the following illness-specific factors associated with asthma: 1) Panic-Fear; 2) Irritability; 3) Fatigue; 4) Hyperventilation-Hypocapnia; 5) Airway obstruction. Each item on the checklist is a symptom commonly associated with asthma (e.g., short of breath, afraid of dying) and the subject is asked to rate the degree to which each symptom affects him or her on a five-point scale ranging from "never (1)" to "always (5)". Of these five factors, the Panic-Fear factor was of primary interest in the current study. The ASC was developed by Kinsman et al. (1973) and information concerning its psychometric properties can be found elsewhere (Kinsman et al.,

1973; Kinsman et al., 1974; Jones et al., 1979).

3) 20 P-F: The 20 P-F is a twenty item, true-false scale consisting of items from the Minnesota Multiphasic Personality Inventory (MMPI) designed to measure a personality variable called panic-fear. The scale was developed by Dirks et al. (1977b ; 1978) and its validity and reliability have been reported elsewhere (Dirks et al., 1978; Jones et al., 1979; Kinsman et al. 1980).

4) Daily Assessment Form: The DAF is a self-report questionnaire developed for use in the current investigation. The DAF was utilized to collect: number of attacks per day; duration of each attack; intensity rating (1:mild-10:severe) of each attack; amount and type of medications ingested each day. For the purpose of this study, an attack was defined minimally as the initial onset of: wheezing, tightening of the chest, and dyspnea. The DAF was completed by patients on a daily basis throughout the entire course of this study.

Pulmonary Function. Five separate measures of pulmonary function were used in this investigation. They were: Peak Expiratory Flow Rate (PEFR); Forced Vital Capacity (FVC); Forced Expiratory Volume in one second (FEV_1); FEV_1/FVC; and Maximal Mid-Expiratory Flow Rate (MMEFR) (see Cherniack, 1977; Ruppel, 1979).

Physician Ratings. The PSRS was utilized as an independent assessment of patient functioning based upon their current level of medication requirements. The PSRS is a nine-point scale ranging from (1) "Mild" to (9) "Constantly disabled". It was developed by Plutchik et al. (1978) "to provide an overall index of asthma severity in terms of dependence of the patient on medication (p. 426)". The PSRS was completed by the primary care physician (or nurse) of each patient involved in this investigation.

Additional Measures

The Asthma Survey Schedule (AmSS; Cautela, 1981) is a 39-item questionnaire which asks patients to provide a wide range of information such as: age, height, medication (dosage and type), allergies, typical symptoms, and particular times of year the patient may consider to be especially troublesome. The AmSS was employed primarily because it provided the investigator with information which was helpful in evaluating other assessment variables (e.g., time of year information was useful when examining data regarding outcome on the frequency of attacks variable).

The 24 Hour History was used to assess and control for variables which could potentially confound the above measures of pulmonary function (e.g., stimulants such as caffeine might result in a temporary improvement). The 24 History is an 11-item questionnaire adapted for use in this investigation. It asks questions such as: How many hours since your last meal? Beverage? It was completed by subjects prior to each pulmonary assessment session in this investigation.

Apparatus

A Collins 13.5 liter water-seal spirometer was used to assess all measures of pulmonary function with the exception of PEFR. The spirometer features a bell-counterweight pulley system, recording pens and a variable speed kymograph. The Collins spirometer and its features is described more fully elsewhere (Ruppel, 1979). A Wright Peak Flow Meter (Wright, 1959) was used to measure the final pulmonary function variable (i.e., PEFR).

Procedure

Assessment Schedule. Approximately one-week prior to the first treatment session, subjects were asked to complete: 1) An Informed Consent Form; 2) The Asthma Symptom Checklist; 3) The 20 P-F; 4) The 24-Hour History; and 5)

The Pulmonary Function Battery. Subjects were also asked to begin collecting baseline data on the DAF and to complete the AmSS and bring it to the first session. Finally, a copy of the PSRS was sent to the appropriate physicians for completion.

All post-treatment sessions were arranged within one-week of the final treatment session and all follow-up sessions, with one exception, were scheduled for at least 4 weeks after the post-treatment session (the exception was one 3 week follow-up due to an unavoidable scheduling conflict). Except for completing the Informed Consent and the AmSS, the procedures for these two sessions followed exactly the same format of the pretreatment session.

Treatment. All treatment sessions were conducted by the principal investigator who had completed 3 years of graduate training in Clinical Psychology. These sessions were conducted in a group format with a minimum of two persons in addition to the investigator present at all sessions. Decisions as to which subjects would attend which sessions were made solely on the basis of convenience for the patients (i.e., membership was not determined according to asthma severity or panic-fear type). Subjects were given the choice of signing up for 1 of 4 class times but were allowed to rotate their meeting times from week to week because of varying schedules and committments. Treatment consisted of a total of five weekly sessions with each session lasting between 60 and 90 minutes. The therapist was blind to the asthma type, severity, and panic-fear type of participants until the completion of the treatment period.

Components of the relaxation training employed in this investigation included: Progressive Muscle Relaxation (Jacobson, 1938; Wolpe and Lazarus, 1966): Cue-Controlled Relaxation (Russell and Sipich, 1973): and Positive Imaging (Shoemaker, 1979).

At the initial session, the general process of progressive relaxation was described to the subjects and each subject was provided with a manual which described each component of the training program. Subjects were asked to use this manual as a guideline for independent practicing of the relaxation techniques. Each subject was encouraged to practice these techniques for 30 minutes daily throughout the course of the investigation and to keep a record of their efforts. As a partial check on the effectiveness of the relaxation exercises, subjects were asked to rate themselves on the Relaxation Thermometer (RT) before and after each treatment and practice session.

Once subjects were taught the steps of the relaxation procedure, they were instructed to employ their relaxation skills, particularly cue-controlled relaxation, as active coping mechanisms in the face of day to day stressful situations. Particular emphasis was made upon the utilization of relaxation skills when faced with the initial cues of an oncoming asthma attack (e.g., chest tightening, dyspnea; slight wheeze) (cf. Sirota and Mahoney, 1974).

Spirometry. With the exception of one session at the pretreatment assessment, pulmonary function sessions for all subjects were conducted by a research assistant in order that the principal investigator would remain blind to the outcome of these assessments. This research assistant was blind to the hypotheses of the investigation as a further attempt to minimize the potential for experimenter bias. All sessions were conducted in the Psychophysiology Laboratory of the Clinical Psychology Program and were performed at the same time of day (plus or minus 1½ hours) for any given subject in an attempt to hold circadian cycle effects constant.

Prior to each assessment session: 1) the peak-flow meter was cleaned;

2) the spirometer was checked in order to ensure it was working properly; and 3) the time, temperature of the spirometer, and the barometric pressure were recorded. The temperature and barometric pressure were needed to convert obtained results from Ambient Temperature Pressure Saturated (ATPS) to Body Temperature Pressure Saturated (BTPS).

Subjects were asked to refrain from ingesting the following items for at least 3 hours prior to each assessment: foods, liquids (with the exception of water and juices); cigarettes. A 24-Hour History was completed before each session in order to monitor such intake. Subjects were asked to sit quitely and complete this questionnaire while the research assistant was preparing the equipment. This procedure was intended to allow subjects time to adapt to the surroundings of the laboratory before the pulmonary assessment began.

The pulmonary function maneuver was explained to each subject prior to the pretreatment assessment session. Subjects were allowed to practice the procedure until (in the judgement of the examiner) they were familiar with the process in order to eliminate learning effects. An additional practice trial was given prior to the post-treatment and follow-up sessions. At each session, three maneuvers on both the spirometer and the peak-flow meter were performed and the results of these trials were averaged. Subjects were encouraged to give maximum effort on all trials.

Results

Of the 15 subjects who participated in the entire 10-week treatment and evaluation program, complete data on all measures were available for only 13 subjects (e.g., one subject inaccurately recorded the frequency of attacks experienced during the baseline period; some follow-up data

of another subject was lost in the mail). As a result, the number of subjects involved in each statistical analysis varied from 13 to 15 depending upon the variable under study.

Treatment Efficacy

The analyses in this section addressed the issue of whether relaxation training resulted in significant improvement for all subjects regardless of asthma type, severity, duration of the illness, or Panic-Fear personality type. Change in status was evaluated from pretreatment to posttreatment and post-treatment to follow-up for all dependent measures. The primary statistical analyses employed were Planned Comparisons. The results of these analyses are summarized in Table 1.

Insert Table 1 about here

Acquisition of the Relaxation Skill. As a check on the degree to which subjects learned to relax during treatment sessions, pre-post RT ratings were analyzed for all 5 relaxation sessions. The results of this analysis indicated that self-ratings decreased significantly in all 5 sessions ($t[14]=-6.95$, $p < .0001$; $t[14]=-5.70$, $p < .0001$; $t[14]=-8.07$, $p < .0001$; $t[14]=-6.92$, $p < .0001$; $t[14]=-6.61$, $p < .0001$, respectively). These results suggest that the subjects involved in this investigation acquired the relaxation skill sufficiently within the treatment sessions.

Frequency of Attacks. The frequency of attacks experienced during pre-treatment, post-treatment, and follow-up periods were analyzed for change in response to treatment. The pre-treatment baseline was defined as the period

between the initial assessment session and the first treatment session. In most cases, this involved a 7-day period, however, in those cases in which a full 7 days did not transpire (i.e., due to scheduling difficulties), the number of attacks recorded were prorated for 7 days. The post-treatment period consisted of the 7 days immediately following the final treatment session and follow-up was defined as the 7 days immediately preceding the final pulmonary assessment session.

The results of this analysis indicated that the frequency of attacks decreased significantly from pre-treatment to post-treatment ($t[12]=-2.01$, $p < .05$). Contrary to expectations, a two-tailed T-Test indicated that frequency of attacks increased significantly between post treatment and follow-up ($t(12)=2.19$, p .05), suggesting that treatment gains were not maintained on this variable. It is important to note that although subjects "relapsed" during the follow-up period, they apparently were no worse off than when treatment began (i.e., pretreatment $M=5.46$; Follow-up $M=4.85$).

Physician Ratings/Medication Usage. PSRS ratings from pre-treatment, post-treatment, and follow-up were examined to see if relaxation therapy resulted in decreased asthma severity (i.e., in terms of medication dependence). Results indicate that a significant decrease in these ratings occurred between pretreatment and post-treatment ($t[14]=-2.83$, $p < .01$) and a further nonsignificant decrease occurred between post-treatment and follow-up. These results suggest that in the opinion of their respective physicians, subjects were less dependent upon their medications for control of asthmatic symptoms as a function of participation in this treatment program.

In addition to PSRS ratings, the daily self-monitoring of medication intake (as recorded by each subject) was examined. These data were not analyzed as a dependent variable but rather, were used to monitor medication patterns throughout the study. The primary purpose of this was to enable the investi-

gator to address whether change on additional dependent measures was a function of participation in the treatment program or changes in levels of medication intake.

Decisions as to whether a given subject's medication had changed were made on a weekly basis according to the following criteria: A given week was assigned an "increase" rating if: a) a particular dosage was increased; b) a new medication was added without discontinuation or decreasing other medications; c) usage of inhalers (i.e., number of sprays per day) increased. A "decrease" rating was assigned if: a) dosage level decreased; b) a medication was discontinued; c) use of inhalers decreased. A rating of "same" was given when medication usage patterns remained identical from one week to the next. An overall rating was assigned to each patient on the basis of a comparison of week 6 (post-treatment) and week 10 (follow-up) medication levels with week 1 (baseline) levels.

On the basis of this procedure the following results were obtained At week 6: 2 subjects had increased medication intake; 3 had decreased; 9 had remained the same. At week 10: 2 subjects were rated as increased, 7 decreased, and 5 remained the same. These results taken together with the decreased physician ratings, rule out medication increases as a confound when evaluating improvement on additional variables.

Pulmonary Function. Five measures of pulmonary function (i.e., PEFR; FEV_1, FVC, FEV_1/FVC, MMEFR) were analyzed to evaluate whether relaxation therapy resulted in improved respiratory functioning. The following results were obtained: 1) no significant improvement was found on three measures of flow rate (i.e., PEFR; FEV_1; MMEFR), however, non-significant increases were observed on two of these measures at the follow-up evaluation (i.e., PEFR;

FEV_1); 2) a significant increase was found on the measure of lung volume (i.e., FVC) between post-treatment and follow-up ($t[14]=2.51$, $p < .05$); and 3) on the FEV_1/FVC measure, a nonsignificant increase at post-treatment was followed by a significant decrease at follow-up ($t(14)=-4.87$, $p < .001$; two-tailed test) as subjects returned to essentially pre-treatment performance levels (pretreatment $M=85.78\%$; posttreatment $M=87.24\%$; follow-up $M=83.93\%$). These results suggest that relaxation therapy may have been of limited benefit to respiratory functioning and, for the most part, this benefit occurred on a delayed basis.

Percent-predicted values for 4 of the above measures (i.e., FEV_1; FVC; FEV_1/FVC; MMEFR) were calculated to assess the degree to which subjects changed as a result of treatment when compared to normative standards established for persons of similar age, height and sex. The largest increase on these measures was a 5.4% increase on the percent-predicted FVC variable at follow-up (pretreatment $M=75.56$; follow-up $M=80.98$). Increases on other measures were considerably smaller and some even showed a decrease (e.g., FEV_1/FVC decreased at follow-up, however, performance was still above normal). Given that a 15% improvement is generally considered to be a minimally acceptance level of clinical significance, these findings suggest that relaxation therapy resulted in only limited improvements.

Panic-Fear Variables. Two measures of panic-fear (i.e., symptom vigilance and personality) were analyzed to assess whether such variables were susceptible to change in response to relaxation therapy. On the measure of symptom vigilance (i.e., the ASC), a significant decrease was observed from pre-treatment to post-treatment ($t[13]=-3.67$, $p < .01$). A further nonsignificant decrease was observed between post-treatment and follow-up. On the Panic Fear Person-

ality measure (i.e., the 20 P-F), nonsigificant decreases occurred at both the post-treatment and follow-up assessments. These findings are consistent with the description of the latter variable being a "trait" measure of panic-fear and the former being a "state" measure (Dirks, et al., 1977). While a significant decrease in the "trait" measure could be viewed as adaptive (ie., because it would indicate decreased panic in response to symptoms), the adtaptiveness of decreased symptom vigilance has been questioned (e.g., Kinsman et al., 1980) and will be discussed presently.

Variables Related to Outcome

The purpose of this section was to assess the degree to which variables such as: asthma severity; panic-fear style; and compliance to treatment instructions, predicted responsiveness to relaxation therapy. The primary statistical analysis employed for this purpose was a Hierarchical Multiple Regression Analysis. Three dependent measures (i.e., frequency of attacks; physican ratings; FEV_1/FVC) were utilized in these evaluations and were chosen because they were judged to be the most relevant from their respective classes of dependent measures (i.e., FEV_1/FVC was chosen over other pulmonary function measures because it is more frequently utilized than these other measures in the asthma-treatment research literature). In all cases, two sets of analyses were computed for each dependent measure. First, pretreatment scores on the independent measures were used to predict post-treatment values on the dependent measures after pretreatment levels on the dependent measures were partialled out. Second, follow-up values on the dependent measures were predicted with post-treatment values partialled out. The results of these analyses are summarized in Table 2.

Insert Table 2 about here

Panic-Fear Style. Since Kinsman et al. (e.g., 1980) have recommended that only specific panic-fear types be "prescribed" relaxation therapy, it was predicted that panic-fear at pretreatment would be related to treatment outcome. The results of the current analysis indicate that neither symptom vigilance nor panic-fear personality were significantly related to asthma severity ratings (i.e., PSRS) or frequency of attacks at either post-treatment or follow-up. On the pulmonary function measure (FEV_1/FVC), while symptom vigilance did not significantly increase predictive ability at either post-treatment or follow-up, panic-fear personality was found to be significantly related to improvement on this variable at post-treatment ($F(1,10)=5.96$, $p < .05$). The combined R^2 for pretest values on FEV_1/FVC, symptom vigilance, and panic-fear personality was .74 with the latter variable accounting for 16% of the total variance. With the exception of this latter finding, the above results do not support the hypothesis that panic-fear personality type predicts responsiveness/unresponsiveness to relaxation therapy.

Severity. It was also hypothesized that asthma severity at pretreatment would predict response to relaxation therapy among extrinsic asthmatics. A Hierarchical Multiple Regression was employed to examine this hypothesis and the results indicate that there was no significant relationship between asthma severity and either dependent measure (i.e., frequency of attacks; FEV_1/FVC) at post-treatment or follow-up evaluations. Thus, the hypothesized relationship between asthma severity and responsiveness to relaxation therapy was not supported in this instance.

A visual inspection of outcome data for severe and nonsevere subjects on the frequency of attacks measure was performed in a further attempt to

evaluate any differential response to relaxation therapy. The mean number of attacks reported per week were calculated for the 5 severe and 8 non-severe subjects over a 9 week period (data for 2 subjects was unavailable). Only the first 9 weeks of this 10 week study were utilized since the number of days this information was recorded in week 10 varied from 1 to 7 and it was felt that prorating would be inappropriate. These weekly means are presented in Figure 1.

Insert Figure 1 about here

A review of Figure 1 reveals the following. FIrst, the nonsevere group of asthmatics actually averaged a greater number of attacks per week than the severe asthmatics in each week of the comparison period. Second, with the exception of week 5, the nonsevere group shows a consistent downward trend in the frequency of attacks whereas the severe group remains at a fairly consistent level. It should be noted that in week 5, two of the nonsevere subjects experienced 17 and 21 attacks, respectively, and together accounted for 38 out of the 56 total attacks for this group. This inspection suggests that the nonsevere subjects may have been more responsive to relaxation therapy than their severe counterparts, however, this conclusion is complicated by the fact that the severe subjects were at a consistently lower frequency of attacks throughout the comparison period and may not have had any room for further improvement on this particular variable.

Compliance. A final prediction was made regarding the relationship between compliance to treatment instructions and favorable response to treatment. Total practice time of the relaxation technique was used as a measure of compliance and a Hierarchical Multiple Regression was employed to examine the relationship between this measure of compliance and favorable outcome as measured

by the PSRS, FEV_1/FVC, and frequency of asthma attacks. The results of these analyses are as follows: 1) On the Physician's Severity Rating Scale Practice Time was significantly related to improvement at the post-treatment assessment ($F[1,11]=10.49$, $p<.01$). The combined R^2 for pretreatment severity ratings and Practice Time was .69with Practice Time accounting for 30% of the total variance. Results at the follow-up period did not demonstrate a significant relationship between Practice Time and severity ratings; 2) No such relationship was found between Practice Time and frequency of attacks or FEV_1/FVC at either the post-treatment or follow-up periods. These results suggest that regular practice of the relaxation technique can significantly reduce the amount of medication required to control asthmatic symptoms even though it may not result in improvement of those symptoms directly.

Discussion

The current investigation attempted to: 1) reconfirm the utility of relaxation therapy as an adjunct treatment strategy for asthmatics; and 2) examine the degree to which asthma severity and panic-fear style were useful in predicting responsiveness to such a treatment strategy. In general, the results of this investigation were inconsistent and somewhat less than robust and did not clearly resolve these issues. In spite of this lack of robustness, several important findings were revealed and will be discussed in terms of: 1) Treatment Implications; 2) Pertinent Psychological and Illness Variables (related to favorable outcome); and 3) Research Implications.

Treatment Implications

While the overall results of this investigation do not unequivocally support the efficacy of relaxation therapy as an adjunct treatment for bron-

chial asthma, certain findings do support its utility. The most consistent and perhaps most important finding was that relaxation therapy resulted in decreased levels of medication needed to control asthmatic symptoms (i.e., as indicated by self-monitoring of medication intake and PSRS ratings). If one considers the potential side effects associated with higher dosages and levels of asthma medication, this finding alone supports the utility of relaxation therapy with this population. In addition, these results allowed the investigator to rule out medication increases an being responsible for improvement on additional dependent measures.

The findings on the frequency of attacks variable did not support the utility of relaxation therapy as clearly. Participation in the relaxation program resulted in a significant decrease in the frequency of asthma attacks when the post-treatment period was compared with the pre-treatment baseline period and that this improvement was not maintained at a one-month follow-up period. Such a "relapse" might cause one to question the long term efficacy of relaxation therapy and the efficacy of relaxation therapy beyond its serving as a placebo. However, when one considers that: 1) the investigation was conducted during the peak of pollen season and at a particularly humid time of year; 2) the majority of subjects (i.e., 11 of 13) who completed the AmSS reported that their asthma was affected by pollen and/or humidity; 3) the majority of subjects were extrinsic asthmatics and hence may not be as responsive as other asthma types (i.e., intrinsics) to relaxation therapy; and 4) that previous research has attested to the efficacy of relaxation therapy with asthmatics above and beyond placebo effects (e.g., Knapp and Wells, 1978); the above questions can be dismissed.

The results of the pulmonary function assessments were similarly inconclusive. The reader will recall that the only significant finding in the expected direction was on the Forced Vital Capacity (FVC) variable at follow-up. (A 5.4% increase was also observed on the percent-predicted FVC at follow-up) and that nonsignificant trends in the expected direction were observed on other measures (e.g., PEFR; FEV_1). These findings suggest that: 1) relaxation therapy may have only a limited direct effect upon respiratory functioning; 2) what effects it does have may be of statistical rather than clinical significance (e.g., the improvement realized on the FVC measure was approximately a 5% increase and less than 15% is not considered to be clinically significant; and 3) those benefits that were achieved appeared on a delayed basis (i.e., at follow-up rather than post-treatment). It may be that relaxation therapy slows down the physiological process in a gradual fashion and hence immediate benefits should not be expected. In addition, it is possible that the asthmatic symptoms of the extrinsic asthmatic may be the result of a Parasympathetic Nervous System (PNS) malfunction in which case, direct improvement on measures of respiratory functioning might not be expected (i.e., because relaxation therapy increases PNS dominance which has been implicated as one cause of bronchoconstriction). This latter consideration is speculatory in nature and warrants further investigation.

The hypotheses regarding the panic-fear variables were also not clearly supported. It was predicted that symptom vigilance would decrease in response to relaxation therapy since it has been described as a "state" measure of panic-fear by its developers (e.g., Dirks et al., 1977c)

and that panic-fear personality scores would decrease in response to relaxation therapy because learning such a skill would result in an increased sense of mastery over one's symptoms and a subsequent decrease in the feeling of helplessness associated with high panic-fear personality. The former hypothesis was confirmed while the latter was not.

While the description of symptom vigilance has been supported, some would question whether it could be viewed as an improvement. For example, Kinsman et al. (1980a) have suggested that high symptom vigilance is adaptive and that relaxation therapy may be detrimental if it reduces such vigilance. However, considering the positive results obtained on other outcome variables in this study (e.g., Physician Severity Rating Scale; frequency of attacks; Forced Vital Capacity); it does not appear that such a position can be supported.

Finally, the analysis of the relationship between compliance with treatment instructions (i.e., daily practice of relaxation skills) does not consistently support the utility of relaxation therapy for treating asthma (i.e., compliance was not significantly related to frequency of attacks or FEV_1/FVC). However, the finding that compliance was related to decreased dosages of asthma medication without subsequent worsening of symptoms does strongly support the value of the "homework" portion of this treatment program in particular, and of relaxation therapy in general.

Pertinent Psychological and Illness Variables

The results of this investigation did not clearly support the usefulness of asthma severity and panic-fear style for predicting favorable/unfavorable response to relaxation therapy. A primary reason for this less than successful

outcome may have been the small sample size and consequent reduced power of the statistical analysis employed. This difficulty potentially effected each of the predict variables discussed below.

Regarding the predicted relationship between panic-fear style and outcome, with the exception of the significant relationship found between panic-fear personality and FEV_1/FVC at post-treatment, the importance of this variable as a predictor of treatment outcome was not supported. Despite the general lack of significance, this one significant relationship was precisely in the direction predicted by Kinsman and his associates (e.g., Kinsman et al., 1980a) and is consistent with their recommendation that relaxation therapy is only appropriate for asthmatics categorized as high panic-fear personality types. Since the current study involved a relatively small number of participants with a somewhat limited range of panic-fear types, more work is clearly required to examine the importance of this variable.

The predictive value of asthma severity at pretreatment was even less useful than the panic-fear style. The reader will recall that neither the regression analyses nor the visual inspections supported the utility of asthma severity for predicting response to relaxation therapy. In spite of this lack of support, several factors preclude the dismissal of this variable as a pertinent predictive factor vis-a-vis relaxation therapy. First, the nonsevere group of subjects experienced a substantially higher number of attacks per week than the severe group throughout the entire course of this investigation. Thus, it may be that severe subjects in this comparison were on high enough levels of medication that the frequency of attacks they experienced had "bottomed out" and hence it would have been difficult to demonstrate further improvement on this variable. In contrast, the nonsevere subjects had a greater opportunity to demonstrate improvement on this variable. Second, a different problem was associated with the FEV1/FVC variable in that severe

and nonsevere subjects did not differ substantially on this measure throughout the study. Since neither group improved dramatically on this measure and both performed within normal limits, it is quite possible that further improvements were not likely due to a "topping out" phenomenon. Finally, it appears that the participants in this study were of the episodic versus the chronic type given that none of the subjects could be categorized as severe according to accepted pulmonary standards (e.g., the Intermountain Thoracic Society defines severe as an FEV_1/FVC of less than 45%; Cooper, 1982). One would not expect dramatic improvements on this variable from episodic asthmatics since, by definition, they usually perform within normal limits except when experiencing attacks.

Research Implications

The inconsistency and inconclusiveness of the results of this investigation attest to the need for additional research in this area. One crucial area for investigation concerns the further identification and delineation of variables which predict response to relaxation therapy. The current study attempted an initial examination of the relationship between: panic-fear personality type; asthma severity; and responsiveness to treatment. However, while the findings of this study are suggestive, they are also limited in that the subject sample did not represent a wide enough range of panic-fear types or illness severity.

Another question which requires further examination is the relationship between asthma type and successful response to relaxation therapy. This question was not addressed in the current study and has been addressed only once elsewhere (i.e., Phillip et al., 1972). Given the potential degree that a variable such as asthma type could pervade findings in other investigations, it seems crucial that its role be clarified. Similarly, the speculation that

there may be a differential physiological basis for the symptoms experienced by intrinsic and extrinsic asthmatics, and the possibility that this differential cause could be related to responsiveness to relaxation therapy calls for further investigation.

Conclusion

In conclusion, it seems that the most important issues which remain inadequately addressed are those which attempt to delineate which subjects will respond favorably to which treatments under what conditions (c.f., Kiesler, 1966; Paul, 1970). Until such variables have been adequately assessed, statements concerning the "blanket indictment of anxiety reduction techniques in asthma" and the "indictment of blanket application" (Kinsman et al., 1980a) of such techniques can not be made conclusively. In addition, clinicians and researchers would do well to pay more heed to the complex and heterogeneous nature of the asthmatic population.

References

Abramson, H.A. & Peshkin, M.M. Psychosomatic group therapy with parents of children with intractable asthma III: The Kohl Family. Journal of Asthma Research, 1978, 16 (1), 21-40.

Alexander, F. Psychosomatic medicine: Its principles and applications. New York: W.W. Norton and Company, Inc., 1950.

Alexander, A. Systematic relaxation and flow rates in asthmatic children: Relationship to emotional participants and anxiety. Journal of Psychosomatic Research, 1972, 16, 405-410.

Alexander, A., Cropp, G., & Chai, H. Effects of relaxation training on pulmonary mechanics in children with asthma. Journal of Applied Behavioral Analysis, 1979, 12 (1), 27-35.

Alexander, A., Miklich, D.R., & Hershoff, H. The immediate effects of systematic relaxation training on peak expiratory flow rates in asthmatic children. Psychosomatic Medicine, 1972, 34, 388-394.

Blanchard, E.B. & Ahles, T.A. Behavioral treatment of psychophysiological disorders. Behavior Modification, 1979, 3 (4), 518-549.

Collisson, D.R. Hypnotherapy in the management of asthma. American Journal of Clinical Hypnosis, 1968, 11, 6-11.

Cooper, A.J. A case of bronchial asthma treated by behavior therapy. Behavior Research and Therapy, 1964, 1, 351-356.

Davis, M.H., Saunders, D.R., Creer, T.L., & Chai, H. Relaxation training facilitated by biofeedback apparatus as a supplemental treatment in bronchial asthma. Journal of Psychosomatic Research, 1973, 17, 121-128.

Dirks, J.F., Jones, N.F., & Kinsman, R.A. Panic-Fear: A personality dimension related to intractability in asthma. Psychosomatic Medicine, 1977b, 39 (2), 120-126.

Dirks, J.F., Paley, A., & Fross, K.H. Panic-fear research in asthma and the nuclear conflict theory of asthma: Similarities, differences and implications. British Journal of Medical Psychology, 1979a, 52, 71-76.

Erskine-Millis, J. & Schonell, M. Relaxation therapy in asthma: A critical review. Psychosomatic Medicine, 1981, 43 (4), 365-372.

Erskine, J. & Schonell, M. Relaxation therapy in bronchial asthma. Journal of Psychosomatic Research, 1979, 23 (2), 131-139.

Gold, W.M. Asthma. American Lung Association, 1976, 1-6.

Goyeche, J., Yukihiro, A., & Ikemi, Y. Asthma: The Yoga perspective Part I: The somatopsychic imbalance in asthma: Towards a holistic therapy. The Journal of Asthma Research, 1980, 17, 111-121.

Graham, P.J., Rutter, M.L., Yule, W. & Pless, I.B. Childhood asthma: A psychosomatic disorder? Some epidemiological considerations. British Journal of Preventive Medicine, 1967, 21, 78-85.

Groen, J.J. & Pelser, H.E. Experience with and results of, group psychotherapy in patients with bronchial asthma. Journal of Psychosomatic Research, 1960, 4, 191-205.

Hatzenbuehler, L.C. & Schroeder, H.E. Desensitization procedures in the treatment of childhood disorders. Psychological Bulletin, 1978, 84 (4), 831-844.

Hock, R.A., Rogers, C.H., Reddi, C., & Kennard, D.W. Medico-psychological interventions in male asthmatic children: An evaluation of physiological change. Psychosomatic Medicine, 1978, 40 (3), 210-215.

Jackson, M. Psychopathology and psychotherapy in bronchial asthma. British Journal of Medical Psychology, 1976, 49, 249-255.

Kiesler, D.J. Some myths of psychotherapy research and the search for a paradigm. Psychological Bulletin, 1966, 65, 110-136.

Kinsman, R.A., Dirks, J.F., Jones, N.F., & Dahlem, N.W. Anxiety reduction in asthma: Four catches to general applications. Psychosomatic Medicine, 1980, 42 (4), 397-405.

Kinsman, R.A., Luparello, T., O'Banion, K., Spector, S. Multidimensional analysis of the subjective symptomatology of asthma. Psychosomatic Medicine, 1973, 35, 250-267.

Kinsman, R.A., Spector, S., Shucard, D.W., & Luparello, T.J. Observations on patterns of subjective symptomatology of acute asthma. Psychosomatic Medicine, 1974, 36, 129-143.

Kinsman, R.A., Dirks, J.F., & Jones, N.F. Psychomaintenance or chronic physical illness: Clinical assessment of personality styles affecting medical management. In T. Millon, C. Green, & R. Meagher (Eds.), Handbook of Clinical Health Psychology. New York: Plenum Publishing Co., 1980 in press.

Knapp, T.J. & Wells, L.A. Behavior therapy for asthma: A review. Behavior, Research and Therapy, 1978, 16, 103-115.

Kotses, H., Glaus, K.D., Bricel, S.K., Edwards, J.E., & Crawford, P.L. Operant muscle relaxation and peak expiratory flow rate in asthmatic children. Journal of Psychosomatic Research, 1978, 22, 17-25.

Kotses, H., Glaus, K.D., Crawford, P.L., Edwards, J.E., & Scherr, M.S. Operant reduction of frontalis EMG activity in the treatment of asthma in children. Journal of Psychosomatic Medicine, 1976, 20, 453-459.

Leigh, D. & Marley, E. Bronchial asthma: A genetic population and psychiatric study. London: Pergamon Press, 1967.

Matus, I. Assessing the nature and clinical significance of psychological contributions to childhood asthma. American Journal of Orthpsychiatry, 1981, 51 (2), 327-341.

Minuchin, S., Baker, L., Rosman, B., Liebman, R., Milman, L., & Todd, T. A conceptual model of psychosomatic illness in children. Archives of General Psychiatry, 1975, 32, 1031-1038.

Paul, G.L. Behavior modification research: Design and tactics. In C.M. Franks (Ed.), Behavior Therapy: Appraisal and Status. New York: McGraw Hill, 1970.

Phillip, R.L., Wilde, G.J.S., & Day, J.H. Suggestion and relaxation in asthmatics. Journal of Psychosomatic Research, 1972, 16, 193-204.

Scadding, J.G. Definition and clinical categorization. In E.B. Weiss & M.S. Segal (Eds.), Bronchial Asthma: Mechanisms and Therapeutics. Boston: Little, Brown and Company, 1976, pp. 19-31.

Schaeffer, G., & Freytag-Klinger, H. Objectifying the effect of autogenic training on disordered ventilation in bronchial asthma. Psychiatr Neurol Med Psychol (Leipz), 1975, 27 (7), 400-408.

Scherr, M.S., Crawford, P.L., Sergent, C.B., & Scherr, C.A. Effect of biofeedback techniques on chronic asthma in a summer camp environment. Annals of Allergy, 1975, 35, 289-295.

Schwobel, G. Psychosomatische therapie des asthma bronchiale. Anzmein Forsch, 1948, 481-488.

Sergeant, H.G.S. & Yorkston, N.J. Verbal desensitization in the treatment of bronchial asthma. Lancet, 1969, 2, 1321-1323.

Spevack, M. Behavior therapy treatment of bronchial asthma: A critical review. Canadian Psychological Review, 1978, 19 (4), 321-327.

Walton, D. The application of learning theory to the treatment of a case of bronchial asthma. In Eysenck, H.J. (Ed.), Behavior Therapy and the Neuroses. Oxford: Pergamon Press, 1960.

Williams, M.H. Asthma: A practical guide for physicians. New York: American Lung Association, 1973.

Wilson, A.F., Honsberger, R., Chia, J.T., & Novey, H.S. Transcendental medication and asthma. Respiration, 1975, 32, 74-80.

Footnotes

This study was the basis of a Masters Thesis at Virginia Commonwealth University. Address reprint requests and other correspondence to: Robert J. Marcello, Clinical Psychology Program, Virginia Commonwealth University, Richmond, Virginia 23284.

Table 1

Summary of Means and Planned Comparisons for all Dependent Measures

Variable	n	df	Pretreatment Mean	Pretreatment S.D.	Posttreatment Mean	Posttreatment S.D.	Follow-up Mean	Follow-up S.D.	Planned Comparisons[1] Pre to Post t-value	Planned Comparisons[1] Post to Fol t-value
Relaxation Therometer										
Session 1	15	14	6.07	2.02	3.00	1.41	-	-	-6.95****	-
Session 2	15	14	5.87	2.07	2.60	1.50	-	-	-5.70****	-
Session 3	15	14	6.47	1.81	2.80	1.47	-	-	-8.07****	-
Session 4	15	14	5.40	2.03	2.60	1.84	-	-	-6.92****	-
Session 5	15	14	6.53	1.68	3.07	1.90	-	-	-6.61****	-
Frequency of Attacks	13	12	5.46	4.31	3.15	3.80	4.84	3.89	-2.01*	2.19
Physician Ratings (PSRS)	15	14	3.33	1.40	2.47	1.30	2.33	1.18	-2.83**	-1.00
Peak Flow	15	14	429.51	110.87	440.78	92.57	453.97	85.67	.66	1.15
Forced Expiratory Volume (FEV_1)	15	14	2.66	1.04	2.69	.94	2.77	,90	.29	.96
Forced Vital Capacity (FVC)	15	14	3.13	1.23	3.12	1.15	3.35	1.18	-.09	2.51*
FEV_1/FVC	15	14	85.78	9.58	87.24	7.77	83.93	9.19	.76	-4.87
Maximal Midexpiratory Flow Rate (MMEFR)	15	14	3.64	2.38	3.67	2.33	3.21	1.32	.14	-1.33
Percent-Predicted Values										
FEV_1	15	-	83.10	19.84	84.12	17.32	86.91	13.89	-	-
FVC	15	-	75.56	18.93	75.60	16.56	80.98	15.41	-	-
FEV_1/FVC	15	-	109.99	13.11	114.87	11.04	104.27	20.47	-	-
MMEFR	15	-	10..45	61.96	103.77	62.58	90.29	34.55	-	-
Symptom Vigilance (ASC)	14	13	3.29	.75	2.72	.93	2.64	.84	-2.67**	-.47
Panic-Fear Personality (20 P-F)	14	13	6.79	2.75	6.50	2.90	6.21	2.45	-.67	-.67

[1] Note. One-Tailed t-tests

*$p < .05$

**$p < .01$

***$p < .001$

****$p < .0001$

Table 2

Relationships Between Predictor Variables: Panic-Fear Style (ASC; 20 P-F); Asthma Severity (PSRS); Compliance (Practice Time); and Outcome Variables: Asthma Severity (PSRS); Frequency of Asthma Attacks; Forced Expiratory Volume$_1$/Forced Vital Capacity (FEV_1/FVC)

Predictor Variable	Step	Variable Added	n	Pretreatment-Posttreatment R^2	Increment R	F	Posttreatment-Follow-up R^2	Increment R	F
				PSRS					
Panic-Fear Style	1	PSRS	14	.39	-	7.81*	.84	-	63.89**
	2	ASC		.39	0.00	0.00	.84	0.00	0.10
	3	20 P-F		.40	0.01	0.07	.85	0.01	0.19
Compliance	1	PSRS	14	.39	-	7.81*	.84	-	63.89**
	2	Practice Time		.69	.30	10.49**	.84	0.00	0.02
				Frequency of Attacks					
Panic-Fear Style	1	Frequency of Attacks	13	.24	-	3.39	.55	-	13.25**
	2	ASC		.25	0.01	0.23	.66	.11	3.17
	3	20 P-F		.26	0.01	0.07	.71	.05	1.62
Asthma Severity	1	Frequency of Attacks	13	.24	-	3.39	.55	-	13.25**
	2	PSRS		.24	0.00	0.02	.58	0.03	.75
Compliance	1	Frequency of Attacks	13	.24	-	3.39	.55	-	13.25**
	2	Practice Time		.30	.06	.94	.61	.06	1.74
				FEV_1/FVC					
Panic-Fear Style	1	FEV_1/FVC	14	.52	-	12.87**	.92	-	143.35**
	2	ASC		.58	0.06	1.61	.93	0.01	0.54
	3	20 P-F		.73	0.15	5.96*	.94	0.01	2.87
Asthma Severity	1	FEV_1/FVC	15	.52	-	12.87**	.92	-	143.35**
	2	PSRS		.61	0.09	2.53	.92	0.00	0.22
Compliance	1	FEV_1/FVC	14	.52	-	12.87**	.92	-	143.35**
	2	Practice Time		.56	.04	1.11	.92	0.00	0.10

*$p < .05$
**$p < .01$

Figure Caption

Figure 1. Mean Weekly Frequency of Asthma Attacks for Nonsevere (NS) and Severe (S) Subjects.

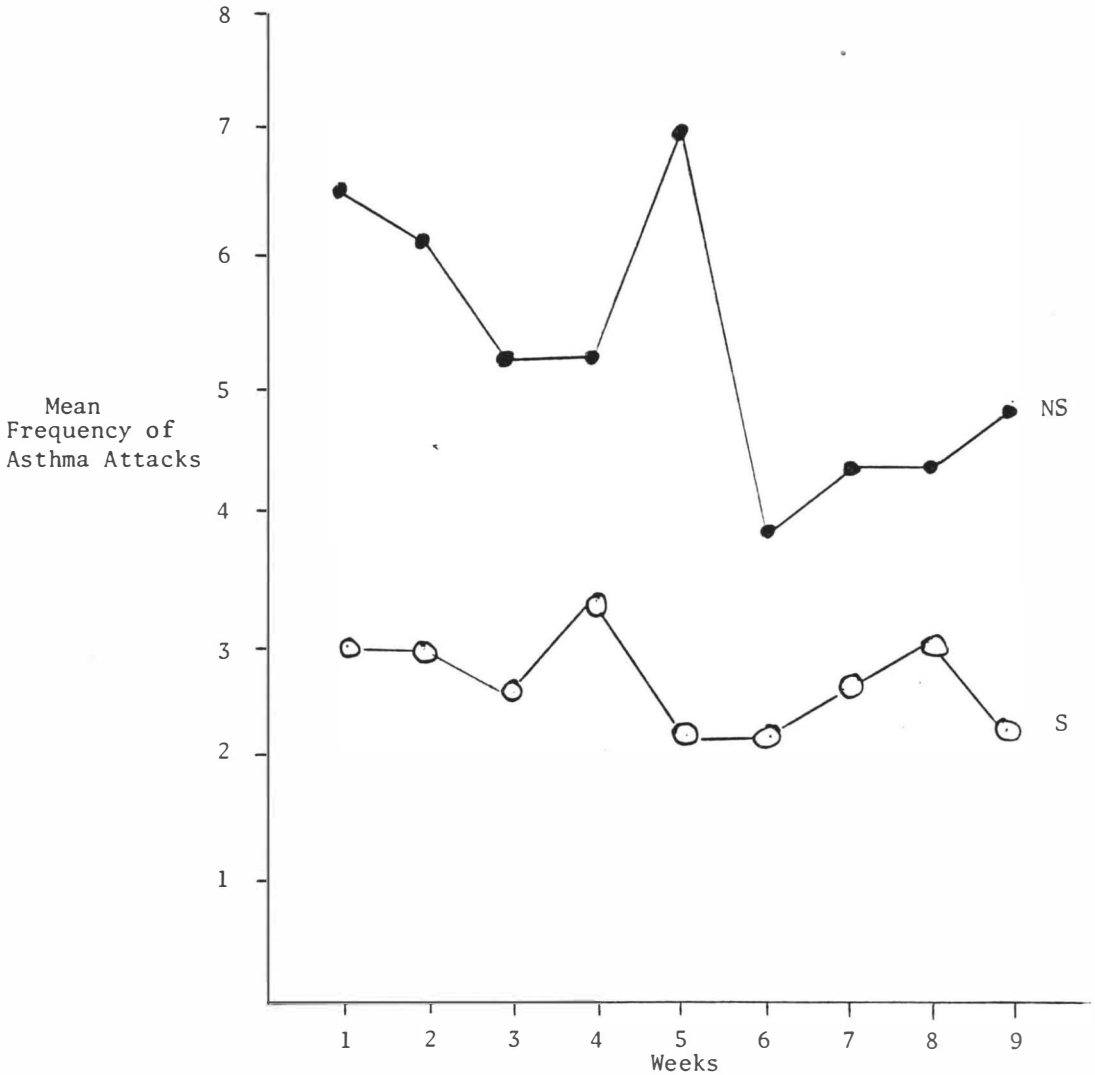


Figure 1. Mean Weekly Frequency of Asthma Attacks for Nonsevere (NS) and Severe (S) Subjects.

Vita

[redacted]