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THE EFFECTS OF A DIAPHRAGMATIC BREATHING EXERCISE PROGRAM  
ON SOME PSYCHOLOGICAL, BEHAVIOURAL, AND BIOMEDICAL  
VARIABLES IN ASTHMATICS.

BY

KENNETH ALBERT EKSTRAND

Thesis presented to the School of Graduate Studies  
of the University of Ottawa as partial fulfillment  
of the requirements for the degree  
Doctor of Philosophy

Ottawa, Canada, 1987



K. A. Ekstrand, Ottawa, Canada, 1988.

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## CURRICULUM STUDIORM

Kenneth Albert Ekstrand was born December 24, 1954 in Montreal, Quebec, Canada. He received the Bachelor of Arts (Pre-Medicine) degree from the University of Ottawa, Ottawa, Ontario, Canada in 1977. He received the Bachelor of Arts (Honors - Psychology) degree from the University of Ottawa in 1979.

## ABSTRACT

This study employed a multidependent research approach to investigate the nature and changes of some biomedical, behavioural, and psychological variables in asthmatics participating in a unique behavioural program designed to alter their maladaptive coping skills of breathing. Based on their medical status at the screening phase, 91 asthmatics were selected (ages 16 - 54) from an initial pool of 274 volunteers. These were randomly assigned to one of three conditions. Two treatment groups participated in a Diaphragmatic Breathing Exercise Program (DBEP) for 16 weeks. An "exercise-only" group also participated in the same physical exercises without the diaphragmatic breathing. A fourth group served as pre-test - post-test controls. All groups self-monitored a number of asthma-related behaviours daily throughout the investigation. An additional series of self-report behavioural and psychological measures were taken at pre-test, post-treatment, and follow-up (eight weeks after the end of treatment). Finally, a series of biomedical measures were taken at pre-test and post-treatment.

Following 16 weeks of treatment, compared with the "exercise-only" and control subjects, DBEP participants reported using less

medication, having less intense attacks, and being more active physically. Also, the DBEP subjects increased their Vital Capacity and Pyruvic Acid levels and decreased their post-exercise Maximum Heart Rate and Lactic Acid levels. The results suggested that the DBEP affects some biomedical, behavioural, and symptom variables in asthmatics. At follow-up, all treatment effects returned to pre-test levels. A number of recommendations for enhancing the effectiveness and persistence of the DBEP, as well as further clinical and theoretical investigations, are presented.

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## CHAPTER I

### REVIEW OF THE LITERATURE

#### Introduction

The first recorded appearance of the word "asthma" in the English language was in 1393; it was used to describe the symptom of severe breathlessness (Saunders & McFadden, 1978). While the term asthma was re-defined to connote a disease process, as it does today, psychological variables have long been implicated in the etiology of asthma, and since 1950 the research and conclusions relating to psychological variables in respiratory allergic illnesses (i.e., asthma, rhinitis, and hay fever) have grown rapidly (Freeman, Feingold, Schlesinger & Gorman, 1964).

Asthma is presently defined as a chronic disease, characterized by increased responsiveness of the tracheobronchial tree to a multiplicity of stimuli. It is manifested physiologically by recurrent paroxysms of dyspnea, of a characteristic wheezing type, caused by widespread narrowing of the bronchi and the bronchioles. The major symptoms are shortness of breath, gasping, coughing, wheezing, and reports of thoracic constriction.

During an asthmatic attack, both inspiration and expiration are hampered by the narrowing of the air passages, but the greater interference is with expiration. Expiration, normally the passive phase

of thoracic respiration, is prolonged and often incomplete due to air being trapped within the lungs. The major problem is to remove the trapped air in order to continue breathing.

Despite numerous studies and theories, asthma remains a complex disease, both at the level of its etiology and its treatment. As Pinkerton and Weaver (1971, p. 81) succinctly put it, "Asthma is perhaps the example 'par excellence' of psychosomatic illness, the clearest demonstration of that complex interrelationship of body, intellect, and emotion, which links patient, family, doctor, and nurse in the elusive quest of etiology and therapeutic efficacy."

#### Etiology

From an etiological standpoint, asthma is a heterogeneous disease. Given that the common denominator underlying the asthmatic condition is a non-specific hyperirritability of the tracheobronchial tree, there are numerous views as to what stimuli are associated with asthma. Consequently, the distinctions between various etiologies of asthma may often be artificial, as an asthmatic attack may be initiated by more than one type of stimuli. Nonetheless, the three major etiological views--physiological, psychological, and learning--are often distinctly maintained.

Physiological explanation. The parasympathetic nervous system controls weeping and respiratory defenses against airborne allergens. One of these responses is the constriction of the bronchial passages which serves to restrict the amount of allergens inhaled. In asthma-

tics this response is so acute that it hinders breathing, especially exhaling; in severe asthmatic attacks, this hindrance can approach suffocation. These parasympathetic responses are believed to be activated reflexively by local irritations of the bronchial tissue, or by direct innervation from the hypothalamus. This latter physiological explanation is believed to be the mechanism by which emotion can trigger asthmatic attacks.

Asthma tends to run in families, although there are also many asthmatics who have essentially no family history of asthma. In view of this apparent discord, Purcell and Weiss (1970) have proposed that a certain organic "vulnerability" may be inherited, most likely related to the reactivity of the respiratory tract rather than to the sensitivity to specific allergens.

Dolovich, Hargreave, and Kerigan (1973) recognized bronchial hyperreactivity which they explained by the Szentivanyi (1968) theory of partial blocking of the beta-adrenergic receptors of the ANS. Within the context of their theory, these authors viewed emotional disturbances as potential aggravating factors, not as psychogenic agents.

In summary, the evidence for the etiology of asthmatic attacks, as viewed from a physiological perspective, favors a polygenic mode of inheritance, resulting from an inherent bronchial hyperactivity to infective, allergic, physiological, or emotional stress (Rees, 1980). However, the role of psychological factors is rarely considered as a

secondary cause--and then only when all physical determinants have been eliminated with substantial evidence.

Psychological explanation. The proposed relationship between anxious states of the mind and asthma can be found in the early works of Freud. Many disciples of orthodox psychoanalysis, as well as many neo-Freudians, referred to bronchial asthma as an organic neurosis, as a psychogenically-caused disorder, and a psychosomatic illness (Federn & Meng, 1939).

The belief that asthma can be triggered by psychological factors is supported by a large body of objective evidence which points to emotional arousal adversely affecting pulmonary function (Faulkner, 1941; Dekker & Groen, 1956; Heim, Constantine, Knapp, Graham, Globus, Vachon & Nemetz, 1967; Clarke, 1970; Smith, Colebatch & Clarke, 1970; Purcell & Weiss, 1970; Mathé & Knapp, 1971; Miklich, Chai, Purcell et al., 1974). The extent to which psychological factors generate or precipitate asthmatic symptoms and attacks is widely variable, but on the basis of reports in the literature, it has been estimated that perhaps in as many as 75% of all cases the part played by psychological factors is significant (Goldenson, 1970; Rees, 1980). These studies and others have demonstrated that emotional causes are implicated in at least some asthmatic attacks.

Learning explanation. In modern learning theory, asthma is considered an acquired breathing behaviour as no patient is born with asthmatic breathing. Whether it arises from an unconditioned stimu-

lus coupled with a conditional stimulus through Pavlovian conditioning, or is caused by instrumental conditioning, or both, appears to depend on the favoured theoretical position.

There is a great deal of experimental evidence to suggest that modifications in breathing pattern, particularly in the direction of asthmatic reactions, can be learned. Such changes have been observed in a number of experimentally neurotic animals (Gantt, 1944, 1947; Liddell, 1951; Masserman & Pechtel, 1953; Seitz, 1959) in which the alterations in breathing were observed incidentally to other behavioural changes deliberately induced in the research manipulation. For example, Masserman and Pechtel (1953) described attacks of asthma-like behaviour which lasted for several hours in a few of their neurotic monkeys. The behaviour appeared when animals were brought to the experimental situation, and disappeared when they were removed from the situation. Gantt (1944) described asthma-like behaviour in his experimentally neurotic dog who developed "... a loud raucous breathing with quick inspiration and laboured expiration ... accompanied by a loud wheezing." This respiratory behaviour began when the dog was brought from the kennel, increased as the experimental room was approached, and disappeared in reverse order. Breathing changes accompanying fear apparently developed immediately after training began, but the pattern of asthma-like respiration developed only after a period of punishment training. These results point to the possibility that this pattern of respiratory behaviour

can be accidentally acquired; that it was performed, in both cases, as a function of the animal's nearness to the experimental situation, suggests the learning phenomenon of stimulus generalization. If this asthma-like respiratory behaviour was followed by a marked reduction in anxiety (i.e., removal of the noxious stimuli), it could be that this pattern of respiratory behaviour was shaped by reinforcement. This would strengthen and shape the asthmatic behaviour.

Borrowing from Mowrer's (1947) two-factor theory of learning, Turnbull (1962) proposed a theoretical explanation of how the development of asthma-like respiratory behaviour might occur in a fear-arousing situation. He proposed that if an asthma-like pattern of respiration (i.e., quick inspiration and long expiration) happened to be performed in expectation of a fear-arousing or painful situation, and if this behaviour led to avoidance or escape from the feared stimulus, then this breathing pattern would more likely occur again in similar situations. Anxiety reduction could then serve as a powerful reinforcement.

Mowrer (1947) and Dollard and Miller (1950) pointed out that in most forms of maladaptive learning the organism acquired self-punishing responses because these had been associated repeatedly with anxiety reduction. Since asthmatic behaviour is uncomfortable and often painful, it is conceivable that this behaviour could serve conflict resolution or anxiety reduction.

This model of asthmatic respiration, learned in response to a conflict or anxiety, would be even more convincing if a feasible explanation could be found to account for why this respiratory behaviour is learned rather than some other.

One possible explanation for this etiology of asthma was suggested by Seitz (1959). Based on some observations made during an experiment, he suggested that early respiratory learning could be an important factor in learning asthma. He used the split-litter technique and assigned six kittens to each of three groups. Group I kittens were weaned at two weeks of age and "cried" intensely for a week or more. Group II kittens were weaned at six weeks, when they began to lap milk from saucers spontaneously. Group III kittens were forced to suckle until twelve weeks of age. Following weaning, all kittens had standardized living experiences. In adulthood the animals were given behavioural tests, including exposure to a feeding conflict; some of the Group I cats developed a chronic, asthma-like respiratory wheezing behaviour following exposure to a feeding conflict. Turnbull (1962) speculated that, within the context of the experiment, the appearance of asthma-like respiratory behaviour could be explained in terms of the animals' early learned association between feeding conflict and intense respiratory response resembling asthma.

The importance of early respiratory learning was also suggested by French and Alexander (1941). Their psychoanalytical investigation

has led them to conclude that asthma has the significance of a suppressed cry of the infant for the mother. From a learning point of view, this suggestion has several advantages. First, the use of respiratory responses as a means of attracting the mother's attention enhances the probability that respiratory responses resembling asthma could be elicited. Second, it focuses on the infantile period, a time when respiratory responses (e.g., crying) are probable, as well as a time when the infant is strongly motivated by intense drives. In Turnbull's (1962) speculative analysis (see below), an attempt was made to relate early respiratory learning to the development of asthma-like behaviour.

In infancy, the child is extremely dependent upon the environment, particularly the mother, for survival; crying is the infant's primary means of signaling for her. At first the cry is probably part of an automatic reaction to distress, which brings the mother to lower the level of noxious stimulation impinging upon the child. Before long, the infant learns to react to discomfort by making voluntary crying responses, and with the mother's continued reinforcement this behaviour is well learned. Since the mother provides the reduction of discomfort as well as some biological pleasures, she soon acquires a great deal of inherent reward value. While the mother's presence is reinforcing, her absence or lack of material attention probably elicits learned reactions associated with need, frustration, pain, and even fear. With continued repetition, a child

could learn to anticipate pain and discomfort when alone and acquire a learned anxiety drive in the absence of the mother. This drive could serve as a stimulus as well as a motivation for the crying response. Turnbull (1962) further speculates that the mothers of asthmatic children frequently ignores the child's cry, and thereby teach the child to fear her absence, as the strong drives impel the infant to seek her attention. Now, if the crying response is no longer reinforced, the behaviour under the stimulation of the anxiety drive will gradually extinguish, while the strength of other responses associated with the crying response, either innately or through learning, becomes comparatively more frequent. The crying response could also be inhibited when a rejecting mother punishes the child for crying when "nothing is wrong." This suggests that punishment may be particularly important in establishing early conflict, and of mediating the respiratory responses of crying and the inhibition of crying.

In the two situations mentioned above, crying was not reinforced for the infant; Turnbull (1962) suggested that the infant would be strongly motivated to find an instrumental response to replace crying when the drive-eliciting stimuli were present. A number of respiratory responses which resemble asthmatic behaviour (i.e., gasping, wheezing, sighing, and coughing) often follow severe crying spells. If the child begins to make respiratory responses resembling asthma instead of the crying response, and if these responses are reinforced

by anxiety reduction associated with maternal attention, their probability of reoccurrence would be increased. Since the mother would likely respond promptly to intense respiratory difficulties, responses resembling asthma could be shaped gradually by reinforcement, until a well developed asthma-like response was present to function in place of the crying response. Turnbull (1962) also suggested that if the mother created a conflict by punishing crying, the child would still need the maladaptive asthmatic responses later in life as a means of meeting the asthmatic's needs.

Turnbull (1962) hypothesized that asthma might be related to early respiratory learning. However, there are many asthmatics whose symptoms appear long after infancy. In order to account for the late onset of asthma, the learning model proposes that something in the order of "instrumental act regression" might be involved (Mowrer, 1940). It could be that respiratory responses similar to those discussed earlier had been learned early in life, but other more adaptive instrumental responses were learned subsequently to take their place. If these latter responses were no longer instrumental in producing reinforcement for the individual, they could then be given up and the individual would "regress" to the earlier learned asthma-like behaviour.

In summary, the learning model of the etiology of asthma suggests that differential reinforcement of breathing patterns can lead to the acquisition of asthmatic respiratory patterns. Although this

model views learning as the primary mechanism in the etiology of asthma, it does not preclude the concomitant influences of both the physical and psychological factors in terms of etiology and treatment. If asthma is regarded as a disturbance of homeostasis from all three of the above-mentioned etiological viewpoints, then the control of as many of the interacting etiological factors as possible may eventually lead to the most effective treatment approach.

### Treatment

Traditional approaches. It is now widely accepted that, whatever its etiology, asthma is responsive to a variety of stimuli including emotional, mechanical, infectious, and allergenic. No one method of treatment has been found to be effective in treating all types of asthma. The most traditional interventions can be classified as either pharmacological or psychotherapy treatment approaches.

Pharmacological approaches. / During the past 20 years many new and effective pharmacological agents for managing asthma have appeared (Morton, Fitch & Hahn, 1981). Some of these new preparations help prevent or reverse exercise-induced asthma. In particular, aerosol medications act rapidly with greatly reduced dosages; these are directed specifically to the lungs. Specific recommendations for the medical treatment of asthma are often difficult to make since asthma is extremely variable from patient to patient, and its course is often unpredictable. Also, there are few controlled studies which have demonstrated conclusively the superiority of one

pharmacological treatment over another; this lack of conclusive evidence is reflected by the vast array of pharmaceutical preparations available. In addition, the occurrence of unacceptable side effects is often unpredictable from patient to patient. Consequently, a treatment regimen for a given patient is usually determined empirically and is based on the severity and chronicity of the asthma, and the patient's response to the chosen intervention. Since the degree of relief from airway obstruction is often incomplete with the use of a single agent, multiple drug regimens are commonly required; the treatment becomes increasingly more complicated as the severity of the disease increases.

In addition, recent findings suggested that the use of aerosol preparations may relate dose-dependent bronchoconstriction to increased drug concentrations, when in fact the bronchoconstriction is caused by the cooling effect of the inhalation (Lewis, Lewis & Tatterfield, 1984).

Follow-up studies (Rackman & Edwards, 1959; Buffum & Settipane, 1966) have shown that 15 - 30% of asthmatic children continue to have frequent asthmatic attacks in spite of rigorous treatment with bronchodilators and allergic hyposensitization. These studies certainly indicate that allergic or physiological etiology alone cannot completely explain the persistence of asthma, and suggest the possibility that other variables may be involved.

Psychotherapeutical approaches. Recent psychosomatic research has evolved to the point of studying the relationship between emotional causes and somatic implications of the asthmatic condition--its purpose being to find the line between objective data (i.e., respiratory efficiency, allergy potential, physical impairment) and the psychodynamic factors in childhood asthma (McNicol, Williams, Allan & McAndrew, 1973). From the psychodynamic perspective, the asthmatic syndrome is the product of unresolved internalized conflicts, and therapy is primarily directed at understanding and working through the early experiences so that the asthmatic can respond more adaptively to stress. Many varied pharmacological and physiological methods have been developed to isolate those asthmatics whose asthma is precipitated by emotional causes (Purcell, Bernstein & Bukantz, 1961; Purcell & Metz, 1962; Purcell, Turnbull & Bernstein, 1962; Feingold, Gorman, Sinder & Schlesinger, 1962; Purcell, 1963; Block, Jennings, Harvey & Simpson, 1964; Purcell, Brady, Chai, Muser, Molk, Gordon & Means, 1969; Purcell, Muser, Miklich & Dietiker, 1969; Purcell & Weiss, 1970; Kinsman, Dahlem, Spector & Staudenmayer, 1977; Dirks, Paley & Fross, 1979).

The most common modalities of psychotherapeutic treatment for asthma are counselling, hypnosis, individual psychotherapy, and family therapy. All of these methods seek insight into the complex interpersonal transactions that are believed to initiate the attacks, and attempt to remedy them with appropriate role changes.

A variety of psychotherapeutic techniques have been employed and claim some degree of success with asthmatics. However, the accounts of success usually have been based on subjective reports and single case studies. In addition, as the successes are isolated clinical reports, one must wonder how many failures go unreported. Due to the complex nature of the etiology and maintenance of stimuli involved in asthma, the success of the psychotherapeutic method of treatment has been inconsistent so far.

Behavioural approaches. The most frequently employed technique for the behavioural treatment of asthma has been some form of relaxation training with the intention of lessening anxiety or reducing sensitivity to eliciting stimuli (e.g., systematic desensitization).

Generally, subjects are taught progressive muscular relaxation and are compared with a control group (Alexander, 1972; Alexander, Miklich & Hershoff, 1972; Philipp, Wilde & Day, 1972; Davis, Saunders, Creer & Chai, 1973). Others have added suggestion or systematic desensitization to relaxation (Moore, 1965; Yorkston, McHugh, Brady, Serber & Sargeant, 1974), or assisted relaxation with EMG feedback (Davies et al., 1973; Scheer, Crawford, Sergeant & Scherr, 1975).

Relaxation training has consistently produced significant improvements in subjects' respiratory function measures (e.g., Peak Expiratory Flow Rate (PEFR), Forced Expiratory Volume in one second

(FEV-1)) when compared to controls (Alexander, 1972; Alexander et al., 1972; Philipp et al., 1972; Davis et al., 1973).

Subsequent researchers have noted that the above studies examined short-term changes in respiratory parameters such as PEFR or FEV-1, and did not examine long-term effects such as the number of asthmatic attacks or amount of medication used (i.e., Blanchard & Ahles, 1979). Studies which focused on the potential long-term benefits of relaxation training (e.g., Davis et al., 1973; Alexander, Gropp & Chai, 1979) failed to find any long-term positive effects in asthmatics. Similarly, discouraging results were reported by Miklich, Renne, Creer, Alexander, Chai, Davis, Huffman, and Danker-Brown (1977) concerning the clinical effectiveness of systematic desensitization (which included relaxation training) to effect significant alterations in lung function of asthmatic children.

Nevertheless, training in muscular relaxation, when employed as a component of deconditioning therapeutic strategies, can be of clinically significant value in the reduction of fear responses to asthma itself (Alexander, 1977; Creer, 1978). On the whole, training in muscular relaxation seems to be an appropriate basic training for asthmatics (Florin & Rojahn, 1980)--note also the reported success of autogenic training from Luthe and Schulz (1969)--a procedure which alone does not effect generalized or long-term improvements in asthmatic attacks.

When comparisons have been made between relaxation training and systematic desensitization, the latter procedure has always been superior (Moore, 1965; Yorkston et al., 1974). It is important to note that while relaxation, relaxation with suggestion, and systematic desensitization procedures produced significant reduction in the number of self-reported attacks, the self-report measures failed to differentiate the three procedures (Moore, 1965).

Recently, biofeedback has been used as an adjunct to relaxation therapy in the treatment of asthma (Davis, 1972; Davis et al., 1973; Feldman, 1976; Harding & Maher, 1982; Khan, 1974; Khan, Staerk & Bonk, 1974; Khan, 1977; Kotses, 1978; Lerro, Hurnyak & Patterson, 1980; Payette, 1977; Scherr, Crawford, Sargent & Scherr, 1975; Scherr & Crawford, 1978; Steptoe, Harling, 1982; Suda, 1977; Visser, 1976); The initial research employed electromyograph (EMG) biofeedback of the frontalis muscle or operant control via biofeedback of oscillatory resistance. It is tempting to interpret the results of the above studies as suggesting that biofeedback alone, or relaxation in conjunction with or supplemented by biofeedback, is an effective treatment with which to alter the pulmonary function in asthmatics; however, the lack of attention-placebo controls (as well as other methodological problems) preclude drawing this conclusion (Alexander, 1980). The only study to include attention-placebo control (Davis et al., 1973) failed to find any long-term benefit. Other research on adult normals (Alexander, 1975; Alexander, White & Wallace, 1977)

seems to indicate strongly that EMG biofeedback procedures should not be considered an effective relaxation-training method.

Operant techniques have been described as:

- counter-conditioning (Khan, Staerk & Bonk, 1974)
- positive reinforcement (Danker, Miklich, Pratt & Creer, 1975; Khan, Staerk & Bonk, 1974; Khan, 1977; Renne & Creer, 1976)
- satiation (Creer, 1978),
- extinction (Neisworth & Moore, 1972)
- time out (Creer, 1970; Creer, Weinberg & Molk, 1974)
- response cost (Creer & Yoches, 1971)
- negative reinforcement and punishment (Alexander, Chai, Creer, Miklich, Renne & Cardoso, 1973; Creer, Chai & Hoffman, 1977)
- instrumental conditioning (Danker, Miklich, Pratt & Creer, 1975)
- visceral learning (Vachon & Rich, 1976)
- biofeedback training (Feldman, 1976)

The studies cited above clearly illustrate that behavioural techniques have established a secure position in the rehabilitation treatment of chronic asthmatics. These techniques, based largely on the principles of operant learning, described applications intended to affect asthma-related behaviours. The vast majority of these treatment approaches made no attempt to change pulmonary function. In fact, in the work reported by Creer et al. (1977), the failure to find changes in

asthma symptomatology or pulmonary function was taken as positive evidence for the specificity of the treatment techniques employed. Comparisons of the various techniques were difficult, as there were different variables measured in these studies.

The outcome of operant studies is mixed. Feldman (1976), Kahn et al. (1974), and Vachon and Rich (1976) reported success at operantly shaping respiratory functions, while Danker et al. (1975) failed to find any evidence of conditioning. Danker et al. (1975) were pessimistic about the success of operant conditioning in respiratory function and criticized Kahn et al. (1974) on the grounds that their study gave no data to show actual conditioning, and that their use of FEV-1 was an effort-dependent measure. They also claimed that the results of Kahn et al. (1974) could be attributed to the effects of suggestion.

Both the Feldman (1976) and Vachon and Rich (1976) studies were cautious about conclusions drawn from their results. Even though the operant conditioning of respiratory functions appeared to have been demonstrated, the degree of improvement was small. According to Vachon and Rich (1976), it was approximately equivalent to one inhalation of Isoproterenol. More importantly, the pre-post Total Respiratory Resistance (TRR) differences were apparently not maintained during the five minutes of inter-trial interval. Future research in this area could be directed at producing larger and longer

maintained effects, as well as assessing generalization to other situations and long-term follow-up.

The only published study in which asthmatic children were trained in social skills (Hock, Rodgers, Reddi & Kennard, 1978) resulted in a tendency toward change for the worse. The results of this study suggest that it can be harmful to the asthmatics to confront them with asthma-prone situations without providing effective asthma-incompatible techniques. Instruction of parents or other significant persons could be helpful in encouraging the asthmatic to overcome their behavioural deficits or anxieties (Hahn, 1966). Although studies which report parent training (i.e., Devine, 1979; Neisworth & Moore, 1972) have shown significant decreases in asthmatic behaviour, these studies have numerous methodological deficiencies (Floris & Rojahn, 1980).

As has been the case with previous methods of treatment (pharmacological and psychotherapeutical techniques), the behavioural techniques also show a large discrepancy in the number of training sessions, forms of reinforcement, types of stimulus heirarchies, variations in dependent variables, and differences in design. Consequently, conclusions based upon comparisons must be done with caution.

The studies reviewed suggest that relaxation training and systematic desensitization can produce statistically significant improvement in the respiratory functioning of asthmatics. Recent reports also

indicate that such improvement may also be obtained through operant conditioning techniques. Despite the number of studies cited, the clinical significance and long-term maintenance of the mentioned improvements are yet to be clearly demonstrated.

#### Physical Rehabilitation through Fitness and/or Breathing Exercises

Children with asthma should be guided to participate in physical activities and play; this is their natural milieu which is essential for normal, personal, social, and emotional development. Participation in these activities which demand good physical conditioning is a prerequisite for the child to cope with asthma and to be accepted by his peers. In the child's world it is the physical ability which counts (Aas, 1983).

Many studies point to the fact that indicators of mental health, such as depression, anxiety, sleeplessness, emotional stability, social adaptability, and stress, can be influenced in a positive way by physical activity (i.e., Folkins, 1976; McCloy, 1980).

The increase in aerobic fitness appears to increase the tolerance and threshold levels of asthmatics so that a higher level of provocation is required for symptoms to occur (Atzelius-Frisk et al., 1977; Fitch et al., 1976; Sly, Harper, Rosselot, 1972). During an attack of asthma, an aerobically-trained person can cope better than an untrained person with the same degree of airway obstruction. Other specific disease-related changes include a reduction in medication

requirements, the frequency of asthma attacks, and absenteeism attributable to asthma (Fitch et al., 1976). In view of the above, asthma should not be viewed as a deterrent to physical pursuits, but an indicator that greater involvement is required.

"Many asthmatic children manipulate over-protective parents, unwary physicians, and misinformed physical educationists to ensure that they can be excluded from sports and physical education. As a consequence, asthmatics often have low fitness levels, poor physique and motor skills, which may result in psychological problems associated with the social implication of 'being left out' (Morton & Fitch, 1981, p. 14)."

A number of recent extensive and comprehensive studies have reported that physical training which is sufficient to improve physical fitness reduces exercise-induced asthma in children (Henrikson, 1983; Hildebrand, Sundsten, 1983; Verrier-Jones, Williams, Zarebbi, Roberts, 1983).

Patients with pulmonary disease benefit from specific breathing exercises which involve a re-training of breathing patterns; these breathing exercises have been used continuously since 1930 (Sinclair, 1984). In chronic lung disease such as asthma, where the precise contribution of any single form of therapy is difficult to assess, an exact effect of breathing exercises has still not been identified. However, patients have been consistently generous in praise of

therapy, and physicians with experience maintain their faith in the benefits attained (Livingstone, Brewerton, Dornhorst, 1958).

Breathing exercise programs, which have included diaphragmatic respiration training, have all been aided by the use of an abdominal corset. This technique is regarded as important in virtually all clinics, although with some differences in emphasis (Bolton, Gandevia, Ross, 1956; Miller, 1953). All of these techniques concentrate on abdominal muscle relaxation during inspiration and contraction during expiration; pursed lip exhalation creates resistance to air flow. Both techniques serve to slow the respiratory rate and reduce upper chest movement and gasping (King et al., 1984; Sinclair, 1984). The above "abdominal" breathing techniques are very different from the "deep diaphragmatic" breathing technique that was taught in this study. The major differences will become apparent when the diaphragmatic breathing technique employed as the key independent treatment variable in this study is described.

#### Diaphragmatic Breathing

Independent variable. The treatment groups in this project were taught a diaphragmatic breathing technique which has been perfected over the past 40 years in Paris, France, through the instruction of professional singers, dancers, actors, and actresses. The majority of people around the world rarely use "deep diaphragmatic breathing." In this breathing technique, expiration is of greater importance, as opposed to partial thoracic breathing in which the inspiration is the

active component. In diaphragmatic breathing, the expiration and inspiration functions are performed by the diaphragm with the assistance of the abdominal, dorsal, and oblique muscles. The surface of the diaphragmatic muscle, in use with the auxiliary muscles, produces a strong push on the lungs to create a transversal enlargement of the thoracic cage with maximum emptying of the lungs during expiration.

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This lateral enlargement of the thoracic cage is maintained during inspiration with the help of the auxiliary muscles, thus creating a muscular corset which is maintained by mainly the oblique muscles. This strong muscular support helps the outside air to enter the lungs passively, which is done as a result of the initial expiration. Since the majority of people use their abdominal, dorsal, oblique, and diaphragmatic muscles in a very limited way, the "diaphragmatic breathing" technique is difficult to master. A series of detailed and precise steps and exercises to re-educate thoracic breathers to use these muscles for diaphragmatic breathing have been developed (see Appendix E).

Over the years this technique has been purported to have dramatic effects on a number of physiological handicaps, including asthma. However, the results were based upon lay observations and not on scientific methodology. Numerous heterogeneously handicapped and normal individuals have participated in this program at the University of Ottawa over the past seven years, and numerous testimonials have been reported from participants that the technique has increased their

energy level, endurance, self-confidence, and self-esteem. However, once again, no objective measures of respiratory efficiency were recorded.

This diaphragmatic program is suspected to affect the individual at various biochemical and physiological levels as a result of the increased oxygenation derived from the increased air exchange. In view of the asthmatic's exacerbated difficulty in expiration during an attack, this technique would appear to be of significant value.

There has been ample research previously to suggest the possibility that programs designed to educate asthmatics in coping skills related to breathing have had some success in fighting off asthmatic attacks (Alexander, 1972; Davis et al., 1973; Feldman, 1976; Khan et al., 1974; Philipp et al., 1972; Sirota & Mahoney, 1974; Vachon & Rich, 1976). This suggests that the diaphragmatic breathing program described here might be equally or more effective.

Doctors at Bronco Junction, a unique camp for severe asthmatic children, have developed and reported a moderate degree of success with specific breathing exercises designed to enable a child to fight off asthmatic attacks (Flarsheim, 1970).

In view of the logical explanation of how the diaphragmatic program has affected the asthmatic at some biochemical and physiological level, and in view of the varying degrees of success with similar programs, it was proposed that the degree and manner in which this treat-

ment would affect the asthmatic should be scientifically investigated.

#### Studies on the Psychological Characteristics of Asthmatics

Psychologists have often regarded asthma as an acquired behaviour, and consequently have offered explanations for its etiology in psychological terms. A number of extensive reviews of experimental and clinical studies have indicated that psychological factors do play some role in the development and maintenance of some asthmatic cases (Block et al., 1974; Freeman et al., 1964, 1967; French & Alexander, 1941; Leigh, 1953; Leigh & Manley, 1967). Some investigators have taken the approach that within the asthmatic population there are sub-groups which can be differentiated on a physiological basis, and that within these sub-groups common psychological characteristics may be found.

Rees (1956), for example, studied 400 asthmatics with parallel observations on a large number of controls. Using observer-rating scales, Rees (1956) reported a significantly higher incidence of anxiety, timidity, sensitivity, and obsessionality in the asthmatic group; however, there was no specific personality found to be associated with asthma. Similar studies, using the MMPI and other measures, have since supported these conclusions (Resh, 1970). Some investigations have suggested that asthmatics differ in certain personality characteristics from the general population or selected sub-groups of asthmatics (Freeman et al., 1964; Kelley & Zeller, 1969;

Purcell et al., 1961, 1962, 1969; Rees, 1956; Rosenthal, Aitken & Zealley, 1973). However, in these studies, little attention was paid to the relationship between subjective (i.e., self-report) and objective (i.e., measures of respiratory efficiency) measures of the asthmatic condition. This relationship appears to be of importance, as a number of research studies have demonstrated that emotional reactions to life stresses can affect the severity of the asthmatic symptoms (Araujo, Arsdell, Holmes & Dudley, 1973; Aitken, Zealley & Rosenthal, 1969; Kinsman, O'Banion, Resnikoff, Luparello & Spector, 1973; Kinsman, Spector, Shucard & Luparello, 1974; Knapp & Nemetz, 1960; Miklich, Rewey, Wess & Kolton, 1973; Purcell et al., 1969). Evidence suggests that patients with asthma of unknown origin (psychosomatic) are psychologically heterogeneous, and that multiple factors in the etiology of this classification of asthma seem probable (Resh, 1970). The search for a specific personality pattern associated with asthma has been carried out, but with little success (Alexander, 1980). No evidence suggests that unique personality factors contribute to the development or the manifestation of asthma as opposed to other chronic illnesses (i.e., Neuhaus, 1958). All the investigations into this have had major methodological flaws.

Recent studies (Jones, Kinsman, Dirks & Dahlem, 1979; Plutchik, Williams, Jerrett, Karasu & Kane, 1978) have led to indications and conclusions that psychological factors play a role in the maintenance

rather than the genesis of asthma--independent of the asthmatic's objective respiratory functioning.

Throughout the studies of adult asthmatics, there was the common suggestion that certain personality traits could be found. However, the most that studies have been able to show is there is some evidence of neuroticism and hostility (i.e., Dekker, Barendregy & Devries, 1956; Franks & Leigh, 1956; Pierloot & Van Roy, 1969; Rees, 1956). However, in studying the phenomonology of this disorder, it seems inadvisable to draw these conclusions from instruments which are designed to indicate the existence of psychopathology and measure only a limited number of personality dimensions.

More recent research, aimed at understanding the asthmatic at various levels of coping styles, has been found very useful in evaluating the role of psychological factors in the maintenance of asthma. There are a variety of levels at which coping styles have been indexed ranging from the patient's general personality characteristics to attitudes about the illness and reported treatment, illness-specific symptomatology, and the specific implementing behaviours evidenced during treatment.

Among asthmatics, maladaptive coping styles have been indexed at two levels by using panic-fear symptomatology (Kinsman et al., 1977) and a panic-fear personality measure (Dirks et al., 1977; Dirks, Kinsman, Jones & Fross, 1978). These measures, which relate to how the patient registers distress during asthmatic attacks, have been

found to influence medical decisions related to length of hospitalization (Dirks et al., 1977), the intensity of prescribed oral corticosteroid regimens at discharge (Dirks, Jones & Kinsman, 1977; Kinsman et al., 1973), and rates of rehospitalization after discharge from residential treatment (Dirks, Kinsman, Horton, et al., 1978). On a clinical basis, measurement at both levels--personality and symptomatology--provides more information about the patient than measurement at one level only. Panic-fear symptomatology appears to index the level of focused concern about breathing difficulties, from symptom minimization (low panic-fear) to symptom vigilance (high panic-fear) (Dahlem, Kinsman & Horton, 1977). In contrast, the related panic-fear personality measure appears to index the resources of the patient to react effectively once breathing difficulties commence. Various combinations of the two measures are possible with different predictions about the effectiveness of the patient's coping.

The pervasive psychological construct of self-esteem, which is apparently related to psychological stress of chronic illness, has received much attention recently, although little in relation to asthmatics. Rosenthal (1973) found no significant differences in self-esteem between normal and asthmatic subjects, while Plutchik et al. (1978) and Tieramma (1979) found that asthmatics tended to have lower self-esteem and self-concepts than normal individuals. Self-esteem has been commonly defined as a measure of the congruency between idealized and actual self-perception. Similarly, self-concept

is defined as a measure of a set of expectancies plus evaluations of the areas or behaviours with reference to which these expectancies are held (McCandles, 1967). Recent studies (i.e., Schimmel, Heilveil, 1982) have also suggested that asthmatics do not differ from normals in self-esteem. Malka (1982) found that asthmatics' self-concepts were not significantly different from those of the chronically ill (cystic fibrosis) or subjects with emotional difficulties. However, Malka (1982) also found that measures reflecting physical self-acceptance (i.e., self-concept) differentiated the healthy child from the asthmatic and cystic fibrosis child. A possible explanation for the fact that asthmatics appear to have normal self-esteem, yet poor self-concept, is raised by Rosenthal (1973) who believes that asthmatics differ from others with disorders containing psychogenic components; asthmatics "tend to feel that they have an understandable illness, as do ... professionals with whom they come in contact" (p. 30).

In summary then, it appears that the search for the "asthmatic personality" has indicated that no such global characteristic exists to account for the asthmatic condition. However, recent research on the role of psychological factors in coping styles has indicated that attitudes about asthma and its treatment could influence medical decisions concerning treatment and the eventual prognosis. As mentioned earlier, measures related to how a patient registers distress during an asthmatic attack have been found to influence medical decisions related to length of hospitalization, intensity of prescribed medica-

tion regimens, and rate of re-hospitalization after discharge. With these findings in mind, it appears that the ability to clearly differentiate coping styles, and change the maladaptive ones, should be the immediate research and treatment goals. In addition, future research and treatment of asthmatics should include efforts toward changing their poor self-concept through improving their characteristically low physical behaviour and respiratory efficiency--as all of these factors appear to have an interactive relationship.

#### Methodological Considerations

The research designed to measure the efficacy of various pharmacological treatments over others has been plagued by numerous practical and methodological difficulties and deficiencies (Saunders & McFadden, 1978).

#### Traditional Techniques

Pharmacological studies. Since asthma is found to be extremely variable from patient to patient, there have been few conclusive studies indicating the superiority of one pharmacological treatment over another. In fact, the pharmacological studies have not yet been able to isolate specific sub-groups of asthmatics for specific treatment regimens, and are still at the level of determining each patient's medication by individual empirical testing. Unfortunately, the occurrence of noxious side-effects is often both unpredictable and common with these interventions; consequently, compliance is one of the major problems in research of this type. In addition, many of the

reported successes in these studies derive their results from either the patient's subjective reports or the clinician's observations, both of which can be biased by expectations and motivation.

Psychological studies. The majority of these studies--both psychological and behavioural--cannot satisfactorily deal with the apparent multicausality in any one individual. However, there are a number of common difficulties and deficiencies which could be overcome to some degree. A frequent methodological weakness in many of these studies is that the accounts of success have usually been based on subjective reports and single case studies (Freeman et al., 1964). Objective measures (i.e., respiratory efficiency, behavioural measures), as well as group-design research, are needed if the results are going to be valid, replicable, and generalizable. Another common weakness in many psychological reports is the poor definitions given of the methodology, dependent and independent variables, and criteria for success (Freeman et al., 1964). If any comparisons, replications, and generalizations are to come from these studies, the above will have to be clearly defined in the future.

Finally, most of these studies have been of a correlational nature, giving weak evidence for causal relationships between variables. In the future, designs that incorporate multivariate analyses of variance of the dependent variables will most likely contribute more interesting and meaningful results.

Behavioural techniques. The behavioural research methods have shown great variances in the forms of reinforcement, number of training sessions, types of stimulus heirarchies, types of dependent and independent variables, and experimental design. Furthermore, many studies on the non-medical treatment of asthma are difficult to evaluate because the design and analyses have been inadequate in relation to:

- 1) the number of cases studied (Cooper, 1964; Means, 1979; Morwood, 1953; Sergeant & Yorkston, 1969),
- 2) lack of objective physiological measurements of airway obstructions (Cooper, 1964; Means, 1979; Morwood, 1953; Sergeant & Yorkston, 1969),
- 3) absence of a control group (Schwobel, 1948; Sergeant, 1974; Yorkston, McHugh, Brady, Serber, Sergeant, 1974),
- 4) results which had been reported to be statistically but not clinically significant (Alexander, 1972; Alexander et al., 1972, 1979; Philipp, Wilde, Day, 1972).

Consequently, conclusions about specific behavioural techniques, based on study comparisons, can only be made tentatively.

With few exceptions (e.g., Neisworth & Moore, 1972), the case studies have involved either anecdotal reports (Cooper, 1964; Rathus, 1973; Sergeant & Yorkston, 1969; Walton, 1960) which do not permit definitive conclusions, or single-subject designs, without reversal,

(Sirota & Mahoney, 1974) making identification of the effective treatment component difficult.

Floris and Rojahn (1980) argued convincingly that even the Neisworth and Moore study could not serve as a good example of operant therapeutic intervention in asthma because of inappropriate application of operant procedures, misleading terminology, and the abrupt withdrawal of attention from asthmatic behaviour without the introduction of some constructive compensatory mechanisms for the child.

Although the majority of the controlled experimental designs have had a no-treatment control group, none have employed a placebo comparison group (i.e., Kotses, Glous, Crawford, Edwards & Scherr, 1976; Scherr, Crawford, Sergeant & Scherr, 1975). The no-treatment group did not provide control for the special attention given to the experimental subjects. This deficiency is crucial, given the psychogenic factors in asthma (Lachman, 1972), the susceptibility of particular response measures to effort and demand influences (Luparello, Lyons, Bleeker & McFadden, 1968), and the inability to identify the specific therapeutic ingredients in systematic desensitization (Kazdin & Wilcoxon, 1976).

Most studies have employed some respiratory function measures (e.g., PEF, FEV-1) which have a validity that may be lacking in self-reports, and avoid the problem of requiring a reliability check. However, the majority of these measures have some difficulties: (a) their effort-dependent nature (Alexander et al., 1972), (b) excessive

exertion on repeated trials which may be harmful to the patient (Danker et al., 1975), (c) the extensive cooperation required of the patient, and (d) frequent subject selection bias for testing (i.e., Haas, Pineda, Axen, Gaudino, Haas, 1985). Although frequently criticized, only recently have alternative methods to PEFR and FEV-1 evolved. The most promising is total respiratory resistance (TRR) determined by forced oscillation technique (FOT) (Feldman, 1976). The measurement of TRR may have the greatest utility in future research, since it is not effort-dependent and does not require maximum exertion. In addition, the measure is amenable to immediate analysis, can be fed back in a variety of forms (i.e., visual, auditory), and requires only a minimum of cooperation from the patient.

In summary, it is recommended for future behavioural research that the reinforcers, dependent and independent variables, and stimulus hierarchy be well defined; that a group design employing multi-dependent variables, and control and placebo groups, be utilized; that an effort-independent respiratory function measure be used; and that designs incorporate the use of discriminant and factor analyses.

It has become evident from past research that no one isolated discipline or treatment approach has satisfactorily dealt with the complex and multifactorial problems of asthma. Consequently, what appears to be required is a multimethod and multidependent measures approach, which employs the strengths and eliminates the weaknesses of each discipline.

## Purpose of the Study - Dependent Variables Selected

### Introduction

Bandura (1977) proposed that cognitive processes mediate change, and that cognitive events can be induced or altered quite readily by experiencing and mastering an effective performance. Briefly summarized, Bandura's (1977) theory is based on the assumption that psychological procedures serve to create and strengthen expectations of personal efficacy. By a similar mechanism, any behavioural performance that is experienced as increased self-efficacy will also serve to strengthen personal efficacy.

There is, in fact, empirical evidence that enhanced self-efficacy tends to generalize to other situations in which performance has been self-debilitating by preoccupation with personal inadequacies (Bandura, Jeffery & Gajdos, 1975). Having an effective coping skill at one's disposal undoubtedly contributes to one's sense of personal efficacy, if that skill enables the individual to overcome previous fears and inhibitions. Acquiring a behavioural skill for controlling potential threats attenuates or eliminates the fear arousal (Averill, 1973; Notterman, Schoenfeld & Hersh, 1952; Szpiler & Epstein, 1976). Behavioural control not only enables one to manage the aversive stimuli, but the stressful situation is likely to be perceived as less threatening as well (Averill, 1973).

In light of the review of literature and Bandura's self-efficacy theory, the approach of this project was from the social learning perspective. The theoretical framework presented by Bandura (1977) can be generalized beyond the psychotherapy domain to other psychological phenomena involving behavioural choices and regulations of efforts in activities that can have adverse effects. In the social learning perspective, asthma can be considered one such psychological phenomenon involving behavioural choices and efforts toward coping with the condition. The amount of effort and degree of success in coping with asthma would be expected to directly affect the asthmatic's self-efficacy.

There has been a void in the literature in that the impact of this "deep diaphragmatic" breathing skill on behavioural, affective, social, and cognitive parameters had yet to be examined. Bandura's (1977) rationale strongly implied such a link. Accordingly, the present study focused on the effect of the "deep diaphragmatic" breathing skill in areas of behavioural, affective, social, and cognitive functioning in asthmatics. Clinically significant improvements in the biomedical, behavioural, or psychological measures of the asthmatic condition (i.e., the asthmatic's reported self-esteem), as a result of this program, could have many social and practical implications.

### Purpose of the Study

The central purpose of this study was to investigate the nature and extent of some psychological, behavioural, and biomedical changes in asthmatics as a result of participation in a unique behavioural program designed to alter maladapted coping skills of breathing. In addition, subjective reports of changes were compared to stringent objective indices of improved physical fitness.

As is evident from the previous review of the etiology, treatment, and characteristics of asthmatics, any single isolated approach has failed to deal adequately with the complex psychophysiological interacting factors in asthma. With these limitations in mind, this investigation involved biochemical, behavioural, and psychological measures before, during, and after the intervention strategy. As the literature indicates, the typical asthmatic case appears to have a number of causes; consequently, no one dependent measure can be expected to accurately reflect the entire effectiveness of any one therapeutic intervention. Through this multimethod approach, with multidependent measures from each discipline, it is believed that a clearer understanding of the variables which mediate and alter the asthmatic condition will result.

### Dependent Variables Selected

There are numerous anecdotal, clinical, and experimental observations and conclusions as to what physiological and psychological

parameters are affected by any successful intervention with asthmatics. In view of these studies, the most pertinent and accessible were selected for this project.

The following components of the asthmatic condition were selected as dependent variables:

1. Asthmatic behaviour - Medication (type, dosage, frequency); asthmatic attacks (intensity, duration, frequency); and asthmatic symptoms (panic-fear, irritability, fatigue, hyperventilation, dyspnea, congestion, worry, anger, loneliness, and rapid breathing).
2. Physical fitness - Blood assays (six biochemical variables (see Instruments section for details)), and cardiopulmonary efficiency (FEV-1, VC, MHR).
3. Recreational and social activity - Recreational activity participation level (frequency, duration, intensity), and social and interpersonal activity (frequency, duration).
4. Self-esteem - A self-report measure of self-esteem, defined as a measure of the congruency between idealized and actual self-perception.

#### Hypotheses Tested

Hypothesis I - It was hypothesized that the experimental subjects would report significant decreases in their use of medication, in their intensity and total duration of asthmatic attacks, and in the severity of their asthmatic symptoms, compared to the pseudo-

training (same exercise program without the diaphragmatic breathing) and control subjects.

The above hypothesis was based on the premise that the treatment intervention ("deep diaphragmatic" breathing) would impart to the experimental subjects better control of their asthma by providing them with a breathing skill which increased oxygenation as a result of increased air exchange. Theoretically, the "deep diaphragmatic" breathing should provide the trained asthmatic with a behavioural coping skill which could eliminate and/or reduce the severity of the asthmatics' difficulty in expiration during an attack by enabling them to utilize their newly acquired muscular fitness and skills to more efficiently remove the trapped air in their lungs. Given this additional coping skill, the asthmatic should be able to reduce or eliminate the reliance on medication to control the asthmatic symptoms. In addition, one would anticipate a reduction in the intensity, duration, and severity of the asthmatic symptoms.

Hypothesis II - It was hypothesized that the experimental subjects would demonstrate significant improvements in the nine biomedical measures of their physical fitness (three cardiopulmonary and six blood assay measures), compared to the pseudo-training and control subjects.

Since the treatment program had a fitness training component (consisting of three one-hour sessions of vigorous exercises per week, in conjunction with "deep diaphragmatic" breathing, for 16 con-

secutive weeks), it was theoretically anticipated that the experimental subjects would demonstrate improvements in their physical fitness levels as a result of participation in the program. The most commonly utilized measures of physical fitness were employed.

Hypothesis III - It was hypothesized that the experimental subjects would report significant increases in their recreational and/or social activity level (recreational and social activity measures), compared to the pseudo-training and control subjects.

Since the treatment program would provide the experimental subjects with a new "deep diaphragmatic" breathing coping skill, enabling them to increase their oxygenation while exercising in the program, it was hypothesized that this new skill would be generalized and applied to recreational and/or social activity. For example, the experimental subjects would use their new "deep diaphragmatic" breathing skills in new recreational and/or social activities in which they could exercise greater control over potential asthmatic attacks (i.e., social gatherings which include exercise). Given the well documented low participation of asthmatics in recreational and/or social activities (compared to the general population), it was hypothesized that an effective treatment program, demonstrating to participants that they could safely participate in more rigorous activities, would result in their increased participation in recreational and/or social activities.

Hypothesis IV - It was hypothesized that the experimental subjects would report a higher level of self-esteem (Rosenberg's (1972) self-esteem scale), compared to the pseudo-training and control subjects.

The above hypothesis was based on the assumption that the treatment program would be largely successful in 1) decreasing asthmatic behaviour, 2) increasing physical fitness, and 3) increasing recreational and/or social activity. Given the above effects, it was hypothesized that the experimental subjects would thereby experience these new behavioural capacities as increases in their self-efficacy. This in turn was hypothesized, in view of Bandura's (1977) theory of self-efficacy, to result in an increase in self-esteem.

## CHAPTER II

MethodSubjects

Subjects were recruited through the mass media (flyers, newspaper, radio, and TV) as a request for volunteers for a multidisciplinary research project at the University of Ottawa on the effects of a specially-designed exercise program for asthmatics (see Appendices J, K, and L). Two hundred and seventy-four asthmatics responded; the selection of 91 asthmatics (38 males and 51 females, ages 16 - 54) was based on their availability and willingness to participate in all phases of the program as well as their medical status at the screening phase (see Instruments - Screening Measures, and Appendix A). The consulting team eliminated from the project any individual who:

1. was not willing or available to participate in all phases of the project;
2. had a history of possible confounding complications (e.g., diabetes, chest disease, severe allergies);
3. had extremely severe or uncontrolled asthma (e.g., frequent and extended hospitalization);
4. had very mild asthma (e.g., infrequent (one/month) and mild asthmatic attacks);
5. did not submit a letter of approval for participation from their physician.

### Design

The 91 subjects who were eligible for participation were ranked in order of the severity of their asthma by our consulting team, based on the information they provided on their screening questionnaires. The subjects were randomly assigned, by random block design, to one of the following three conditions: there were 20 subjects in each of the two sub-groups of the treatment condition, 20 subjects in the pseudo-treatment condition, and the control group consisted of 31 subjects (in anticipation of a greater attrition rate):

1. Condition Tb - Physical exercises program using diaphragmatic breathing. One group of subjects was instructed by a qualified instructor (an asthmatic) in the diaphragmatic breathing technique employed (Ta). The second group of subjects was instructed by another qualified instructor (non-asthmatic) in the diaphragmatic breathing technique employed (Tn).
2. Condition Te - Physical exercises program without diaphragmatic breathing. This group was instructed by a third instructor (a non-asthmatic) who was qualified in the exercise program employed. The subjects in this group were given the same exercise program as those in Condition Tb (see

Appendix E) without the diaphragmatic breathing instructions.

3. Condition C - No "training" instruction. This group served as the "wait-list" controls.

Although the three conditions of Tb, Te, and C initially had 40, 20, and 31 subjects respectively, attrition resulted in uneven group sizes, and the analyses were performed only on subjects who completed all phases of the program. Table A presents the three conditions' main demographic variables and number of subjects at pre-program, before and after attrition. As is shown, subjects who were older and/or had more severe asthma tended to drop out. Since the subjects in conditions Tb and Te were involved in a rigorous exercise regimen, it appeared that their attrition was a result of increased asthmatic difficulties caused by participation. The high attrition in condition Te is discussed later (in Discussion). Subjects in condition C may have dropped out when they realized that they would have to do extensive self-monitoring for six months before participation in the treatment program; in addition, the older and/or more severe asthmatics in condition C appeared to be the least motivated to wait six months to participate in the treatment program.

Table A  
Group Size and Means of Demographic Variables for the  
Three Conditions at Pre-Program Before and After Attrition

| Variable               | <u>Condition</u> |        |        |
|------------------------|------------------|--------|--------|
|                        | Tb               | Te     | C      |
| Before Attrition       |                  |        |        |
| Group Size             | 40               | 20     | 31     |
| Age                    |                  |        |        |
| Mean                   | 30.30            | 37.52  | 37.14  |
| Standard Deviation     | 12.33            | 11.81  | 9.34   |
| Sex Ratio: Male/Female | 17:23            | 9:11   | 14:17  |
| Asthma                 |                  |        |        |
| Mean Severity          | 280.27           | 280.92 | 249.30 |
| Standard Deviation     | 91.16            | 100.18 | 86.14  |
| After Attrition        |                  |        |        |
| Group Size             | 32               | 12     | 23     |
| Age                    |                  |        |        |
| Mean                   | 28.61            | 34.92  | 32.91  |
| Standard Deviation     | 11.21            | 10.53  | 6.55   |
| Sex Ratio: Male/Female | 12:20            | 4:8    | 10:13  |
| Asthma                 |                  |        |        |
| Mean Severity          | 275.96           | 266.50 | 237.17 |
| Standard Deviation     | 83.48            | 85.55  | 80.20  |

Two diaphragmatic breathing sub-groups (Sub-groups Ta and Tn) were included to determine if specific instructor characteristics differentially affected treatment expectations and evaluations. However, for purposes of the main hypotheses, these two groups were combined. Condition Te was included as an attention-placebo control group in order to better assess changes in the asthmatics due to the attention paid to subjects in treatment, and to expectancy effects. The suggestion by Paul (1969) to include an attention-placebo control group is essential for the accurate assessment of the treatment of asthma, given the substantial documentation of asthma being induced by suggestion and placebo.

Subjects in all three conditions underwent a series of psychological tests at pre-test, treatment, and follow-up evaluations, and 10 randomly selected subjects from each group also underwent a series of physiological tests at pre-test and treatment evaluations (see Procedure and Instruments sections).

#### Procedure

The exercise program for Conditions Tb and Te involved three (3) one-hour sessions per week for 16 weeks of the specified exercise program (see Appendix E for the program details). Condition Tb subjects participated in this rigorous "calisthenic-like" program which was designed to:

1. maximize the use of the respiratory muscles;

2. teach the use of these exercises to stop an asthmatic crisis;
3. improve exercise tolerance, and
4. develop sufficient fitness to pursue other recreational and social activities without concern for provoking an asthmatic attack.

In contrast, Condition Te subjects participated in the above "calisthenic-like" program with only 3 and 4 above as their goals. No "deep diaphragmatic" breathing in conjunction with the physical exercises was taught. All subjects received Appendices B to G inclusively prior to the start of the program (consisting of postscreening correspondence; pre-program assignments, informed consent, introduction to program assignment, pre-test questionnaire, respiratory and physical retraining program manual, drugs program manual, and human body program manual), and were requested to return the appropriate information by the beginning of the program.

The two experimental conditions (Conditions Tb and Te) consisted of 32 and 12 subjects respectively (after attrition). Psychological measures were taken at pre-test, post-treatment, and eight weeks later at follow-up, for all three conditions (Tb, Te, and C).

#### Instruments

In order to measure the performance parameters, objectively, a number of physiological, behavioural, and psychological tests were

administered to each subject at pre-test, treatment, and follow-up evaluations. The following is a list of the instruments employed:

Screening Measures:

1. Screening questionnaire: All 274 asthmatics who responded to the initial request for volunteers for this project were sent the Screening questionnaire (Appendix A). Our own consulting team eliminated from the project any individual with a history of possible confounding complications (e.g., severe allergies, chest disease, diabetes), or was not available to participate in all phases of the 26-week evaluation period.

2. History: The remaining eligible asthmatics (124) were then sent a package which included: a) post-screening correspondence, b) pre-program assignment, c) informed consent, and d) physician's letter of approval (see Appendices B and D). Prior to entering the research project, each subject was required to provide a letter of introduction from their physician which included a history of their condition, a summary of previous diagnoses, current medications, a statement of the subject's present condition, and their physician's recommendations regarding their potential participation in the program (see Appendix D). Ninety-one (91) asthmatics were selected for the project based on the above screening measures.

Asthmatic Behaviour Measures:

Due to attrition in the three conditions during the 16-week treatment and 8-week follow-up periods, complete data for the follow-

ing measures were available for 32, 12, and 23 subjects in Conditions Tb, Te, and C respectively.

1. Medication and attack diary: A diary was constructed in which each subject kept a detailed daily record of medication usage and number of attacks throughout the entire 26 weeks of the project (pre-test, treatment, and follow-up). The subjects recorded type, dosage, circumstances, and time medication was taken, as well as intensity, duration and circumstances of their asthmatic attacks (Appendices B and C). This data was collected every two weeks throughout the project.

2. Asthma symptom checklist: An adapted version of the scale developed by Kinsman et al. (1973, 1977) was constructed. The 10 symptom categories of panic-fear, irritability, fatigue, hyperventilation-hypocapnea, dyspnea, congestion, worry, anger, loneliness, and rapid breathing were found to have test-retest reliabilities of .92, .88, .89, .80, .86, .78, .85, .79, .79, and .75 respectively. Cronbach's alpha was calculated to be .84 for this measure ( $p \leq .05$ ), indicating high internal consistency of the scale items for this sample. In order to ascertain whether this treatment program could decrease or eliminate specific symptoms, this scale was modified for this study in an attempt to increase its sensitivity to relatively small changes in asthmatic symptoms. The subjects were requested to report the frequency with which each of the symptoms were typically present in their asthma attacks over the previous four

months (for pre-test and treatment), and two months subsequent to the program (for follow-up). The 11-point scale ranged from never to always.

Example:

"Typically, over the past four months I have experienced the following reactions during an asthmatic crisis: Rapid breathing never . . . . . always."

The scale consisted of 50 asthmatic symptoms; these 50 items allowed for the identification of the various symptom clusters (Appendix C).

Biomedical Measures of Fitness:

Due to the limited availability of laboratory resources (e.g., lab time, technical assistance, and funds), it was determined that only 50 percent of the subjects from each condition, randomly selected, would have biomedical fitness assessed. Due to some methodological difficulties and attrition, there was complete biomedical data available for only 13, 4, and 7 subjects in Conditions Tb, Te, and C respectively.

1. Cardiovascular efficiency: Electrocardiogram, blood pressure, and pulse rate. These measures were taken prior to and after a five-minute bicycle exercise drill (specified workload), at both pre-test and post-treatment evaluation time periods. Electrocardiogram and blood pressure measures were utilized as indicators of potential risk to the subject, whereas post-exercise pulse rate was

employed as a measure of fitness.

2. Respiratory efficiency: Spirometric measures of basal oxygen intake, vital capacity, inspiratory and expiratory reserve volume, tidal volume, and forced expiratory volume, were taken at both the pre-test and post-treatment evaluation time periods. For the purpose of this study, vital capacity and forced expiratory volume (in one second) were selected as fitness measures.

3. Blood assays: The following blood measures were taken prior to and after a five-minute bicycle drill: Ph level, base excess, lactate level, pyruvate level, hematocrit level, and hemoglobin level. These measures were taken at both pre-test and post-treatment evaluation time periods as measures of fitness.

#### Asthma-Related Behavioural Questionnaires

Complete data for the following measures was available for 32, 12, and 23 subjects in Conditions Tb, Te, and C respectively.

1. Physical activity questionnaire: A test was constructed based on the Statistics Canada (1976) survey on recreational activities, and the Ontario Ministry of Culture and Recreation's (1981) research report on physical activity patterns in Ontario. The 40 most popular physical and recreational activities were selected and listed from most popular to least popular. The subjects were requested to estimate the frequency and average duration (in hours and minutes) of their participation in each activity over the previous four months (for pre-test and post-treatment) and subsequent two

months after the program (for follow-up) respectively. Additional space was allocated for activities not listed, and only activities outside the treatment program were included (Appendix C). Cronbach's alpha was .74 for this measure ( $p \leq .05$ ), indicating an acceptable internal consistency of the scale items for this sample.

2. Social and leisure activity questionnaire: A test was constructed on the Statistics Canada (1976) survey on recreational and other leisure activities. The 18 most popular areas of social and leisure activities were selected from the survey. The subjects were requested to report frequency and average duration (in hours and minutes) of their participation in each activity over the previous two weeks at pre-test, post-treatment, and follow-up respectively. A two-week retrospective survey (rather than four months), was selected as being sufficient to sample lifestyle changes in this area. Additional space was allocated for activities not listed, and only activities outside the program were included (Appendix C). Cronbach's alpha for this measure was .47 ( $p \leq .05$ ), indicating this item pool to be quite heterogeneous in content, for the people in this study.

#### Self-Perception Measures:

1. Self-esteem: Rosenberg's (1972) self-esteem scale (RSE) was administered at pre-test, post-treatment, and follow-up. Rosenberg (1972) defined self-esteem as a measure of the congruency between idealized and actual self-perception. Complete data for this measure

was available for 32, 12, and 23 subjects in Conditions Tb, Te, and C respectively. The scale consisted of 10 items. Silber and Tippet (1965) obtained a two-week test-retest reliability coefficient of .85 for 28 college subjects, and Rosenberg (1965) reported a coefficient of reproducibility ( $\text{Rep.} = 1 - \frac{\text{total \# errors}}{\text{\# items} \times \text{\# subjects}}$ )

of .92 for his New York high school subjects ( $N=5,024$ ). Silber and Tippet (1965) correlated RSE scores against three other measures of self-esteem:

1. Kelly Repertory Test, sum of (Self-Ideal) discrepancies on 20 bipolar dimensions,  $r=.67$ ,
2. Health Self-Image Questionnaire, sum of 20 selected items,  $r=.83$ , and
3. Interviewers' ratings of self-esteem,  $r=.56$ .

The above convergent validity values exceeded the correlation of .53 between two different "traits" (self-esteem and self-image stability) measured by the same method (Guttman scales). A strong case for construct validity of the RSE scale has been emphasized by the theoretically predicted associations which were obtained with Rosenberg's (1972) large New York group and "cross-validation" by similar findings with other subjects (Wylie, 1974; pps. 186-189). These coefficients were satisfactory in terms of the criteria established by Guttman (1950) and Mengel (1953).

Each subject was requested to respond with regard to their self-

perception.

Example: "I take a positive attitude toward myself."

- A) \_\_\_\_\_ Strongly agree
- B) \_\_\_\_\_ Agree
- C) \_\_\_\_\_ Disagree
- D) \_\_\_\_\_ Strongly disagree

The subjects' responses were scored on a 10-item Guttman scale, with each item score ranging from 0 to 2. Possible total scores ranged from 0 to 12. The lower the score, the higher the perceived self-esteem (Appendix C).

Manipulation Checks:

1. Program expectation and evaluation questionnaire:

An adapted version of a questionnaire developed by S. E. Dotzenroth (1976) was constructed. This consisted of a series of five bipolar scales designed to assess participants' expectations regarding the program's effectiveness in alleviating asthmatic symptoms and difficulties.

Example:

How successful do you think this program will be in helping you decrease the amount of medication you require?

Not Successful . . . . . Extremely Successful

This questionnaire was administered to the two treatment conditions, Tb and Te, two weeks into the treatment phase. Treatment Con-

dition Tb was also analyzed in its two sub-groups: Ta and Tn. The same areas were again tapped retrospectively at the end of the treatment phase (Appendix I). Cronbach's alpha was calculated to be .89 for the program expectation questionnaire, and .97 for the program evaluation questionnaire, ( $p \leq .05$ ) in each case, indicating a high internal consistency of the scale items. This study was implemented following the Design Chart on the following page.

DESIGN CHART

Instruments were utilized on the conditions at various times to evaluate the program's effects. The flow chart below indicates when the instruments were administered to each condition.

| Group                                                      | <u>TIME</u>               |                            |                           |
|------------------------------------------------------------|---------------------------|----------------------------|---------------------------|
|                                                            | Pre-test<br>(Dec. - Jan.) | Treatment<br>(Jan. - Apr.) | Follow-up<br>(May - June) |
| Condition Tb<br>treatment-breathing                        | 1,2,3,4                   | 2,3,4                      | 3                         |
| Condition Te<br>treatment-exercise                         | 1,2,3,4                   | 2,3,4                      | 3                         |
| Condition C<br>(test - retest<br>waiting list<br>controls) | 1,2,3                     | 2,3                        | 3                         |

Dependent Measure Codes

- 1 - Screening measures (personal data, history questionnaire, pre-program assignment, and informed consent) (Appendices A, B, D).
- 2 - Biomedical measures (VC, FEV, MHR, PH, base excess, LA, PA, HTC, and HB).
- 3 - Psychological and behavioural measures (physical and social activity, self-esteem, ASC, medication and attack diary) (Appendix C).
- 4 - Manipulation checks (program expectations and evaluations, and program attendance) (Appendix I).

## CHAPTER III

## RESULTS

Overview

In order to simplify the reporting of the findings in the investigation, the results will be presented in the following sections:

(A) Re Hypothesis I: "It was hypothesized that the experimental subjects would report significant decreases in their use of medication, in their intensity and total duration of asthmatic attacks, and in the severity of their asthmatic symptoms, compared to the pseudo-training (same exercise program without the diaphragmatic breathing) and control subjects."

Asthmatic Behaviour Treatment Effects: A focus on levels of medication, attack intensity, attack duration, and asthmatic attack symptoms;

(B) Re Hypothesis II: "It was hypothesized that the experimental subjects would demonstrate significant improvements in the nine biomedical measures of the physical fitness (three cardiopulmonary and six blood assay measures), compared to the pseudo-training and control subjects."

Biomedical Fitness Treatment Effects: These include measures of (i) blood assays (PH; base excess, hematocrit, hemoglobin, pyruvic

acid, and lactic acid levels) and (ii) cardiopulmonary efficiency (forced expiratory volume, vital capacity, and maximal heart rate);

(C) Re Hypothesis III: "It was hypothesized that the experimental subjects would report significant increases in their recreational and/or social activity level (recreational and social activity measures), compared to the pseudo-training and control subjects."

Recreational and/or Social Treatment Effects: This section examines levels of physical and social activity, extracurricular to the treatment program;

(D) Re Hypothesis IV: "It was hypothesized that the experimental subjects would report a higher level of self-esteem (Rosenberg's (1972) self-esteem scale), compared to the pseudo-training and control subjects."

Self-Esteem Treatment Effects: A focus on the level of self-esteem;

(E) Program Attendance, Expectations, and Evaluation; and

(F) Summary of Results.

The design of the investigation was a 3 x 3 repeated measures design (three conditions: diaphragmatic breathing, exercise, and controls, by three time periods: pre-test, treatment, and follow-up) with a total of 25 dependent variables. Separate multivariate analyses of variance (MANOVAs) were performed on each hypothesis, using the relevant dependent variables.

The Statistical Analysis System (SAS) at the University of Ottawa was employed to perform these analyses which included repeated measure MANOVAs, repeated measure ANOVAs, repeated measure ANCOVAs, computation of demographic information, and appropriate post-hoc procedures (i.e., Schéffe's test).

The two possibilities for follow-up analyses to significant MANOVA findings, namely, a series of univariate ANOVAs, or discriminant analysis, were initially considered for this investigation.

ANOVA is commonly conceived as being useful for specific hypotheses about single variables and group separation (i.e., Spector, 1977). However, discriminant analysis provides the test for the number of significant dimensions accounting for group differences. Spector (1977) argued that discriminant analysis was not the appropriate technique for identifying significant MANOVA findings due to the fact that the weights derived from the discriminant analysis had little interpretive use when the predictor (dependent) variables were correlated. However, several authors (e.g., Cooley & Lohnes, 1971; Tatsuoka, 1970, 1971) demonstrated the interpretive value of the discriminant structure matrix, which showed the correlation between the original predictor variables and the derived discriminant function scores. This approach was developed to avoid the known interpretive limitations of discriminant weights - limitations that are central to Spector's arguments against the use of discriminant analysis.

A study by Adams, Laker & Hulin (1977) illustrated how MANOVA results could be effectively followed by univariate ANOVA and discriminant analysis techniques. They used ANOVA F tests to show the separate contributions of single variables to group separation. Discriminant analysis was then used to interpret the multivariate structure of their data. Their interpretations were made with considerable confidence because of their large sample size ( $N=1,313$ ).

Although discriminant analysis is uniquely useful for identifying the underlying contribution of the individual variables to the dimensions of multivariate data, ANOVA is desirable for specifying the individual contributions of each variable to group separation (provided the correlation between dependent variables is taken into consideration). Given that the relatively small sample size ( $N=67$ ) in this investigation would require cautious interpretation of a discriminant analysis, as well as the fact that post-hoc univariate ANOVAs could adequately interpret the findings in relation to the hypotheses, the employment of the univariate ANOVA technique was decided on as the post-hoc procedure to significant MANOVA findings.

Since the probability of Type I error is equal to the chosen significance criterion (in these ANOVAs  $\alpha = .05$ ), one can be confident when rejecting the null hypothesis that the decision is likely to be correct. However, one runs the risk of committing a Type II error, that is, accepting the null hypothesis when in fact there is a treatment effect present. The probability of a Type II

error is  $B$ , and the complement of the probability of a Type II error, or  $1-B$ , is the probability of getting a significant result and is called the power of the statistical test. In order to be aware of the probability of a Type II error, power analyses were performed on the statistical tests of the dependent measures employing Cohen's (1977) method (see Appendix M). The pre-test correlations among the dependent variables are presented in Appendix N. Finally, the means and standard deviations for all pre-test dependent variables (by group) are summarized in Appendix O. Analyses of variance (ANOVA) across groups at pre-test revealed that the groups were not statistically different with respect to Age, ( $F(3,63) = 1.65, p = 0.187$ ), Asthma Severity ( $F(3,63) = 0.583, p = 0.628$ ), Asthma Symptoms ( $F(3,63) = 1.259, p = 0.296$ ), Medication Level ( $F(3,63) = 1.175, p = 0.326$ ), and Attack Time ( $F(3,63) = 1.052, p = 0.376$ ). However, significant pre-test differences between conditions were found on Physical Activity, Social Activity, and some Biomedical measures. These are reported and discussed under the appropriate headings in Chapters 3 and 4 (Results and Discussion).

A. Re Hypothesis I: "It was hypothesized that the experimental subjects would report significant decreases in their use of medication, in the intensity and total duration of their asthmatic attacks, and in the severity of their asthmatic symptoms, compared to the pseudo-training (same exercise program without the diaphragmatic breathing) and control subjects."

#### Asthmatic Behaviour Treatment Effects:

For the purpose of testing Hypothesis I, two 3 x 3 repeated measures MANOVAs were performed with three and 10 dependent variables respectively. The data collected at pre-test, treatment, and follow-up were analyzed for all 13 dependent variables.

The first MANOVA with repeated measures was a 3 (conditions) x 3 (time periods), with Medication Level (MED), Total Attack Duration (DUR), and Average Attack Intensity (INT), as the dependent variables.

All the main effects were significant to the .05 level of probability (Table I), indicating that there was a significant difference between the three investigative conditions as well as across the three time periods. There was also a significant interaction between the condition effect and the repeated measures effect ( $p \leq .005$ ).

A series of repeated measures one-way ANOVAs on each dependent variable (MED, DUR, INT) - was performed as the post-hoc procedure to the above MANOVA. Table 2 summarizes the findings. As is shown, group differences were found for medication level ( $F(2,64) = 9.04$ ,

Table 1

Summary of MANOVA with Medication Level,  
 Intensity of Attacks, and Attack Duration

| Source            | Calculated Values                            | Probability > F |
|-------------------|----------------------------------------------|-----------------|
| Conditions        | $\hat{\Lambda} = .842$<br>$F(4, 126) = 2.82$ | 0.0277          |
| Repeated Measures | $\hat{\Lambda} = .830$<br>$F(4, 61) = 3.13$  | 0.0209          |
| Interaction       | $\hat{\Lambda} = .697$<br>$F(8, 122) = 3.02$ | 0.0039          |

Multivariate Statistic Used: Wilk's Lambda Criterion ( $\hat{\Lambda}$ )

Table 2

Summary of Repeated Measures One-Way ANOVAs on Medication Level,  
Attack Duration, and Intensity of Attack at Each Time Period

| Variable      | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|---------------|---------|--------------------|----------------|--------------|--------------|
| Pre-test MED  | Between | 2                  | 37909.58       | 18954.79     | 1.74         |
|               | Within  | 64                 | 697346.10      | 10896.03     |              |
|               | Total   | 66                 | 735255.67      |              |              |
| Treatment MED | Between | 2                  | 171697.20      | 85848.60     | 9.04 ***     |
|               | Within  | 64                 | 607967.22      | 9499.49      |              |
|               | Total   | 66                 | 779664.42      |              |              |
| Follow-Up MED | Between | 2                  | 69067.13       | 34533.56     | 2.51         |
|               | Within  | 64                 | 881198.48      | 13768.73     |              |
|               | Total   | 66                 | 950265.61      |              |              |
| Pre-test DUR  | Between | 2                  | 299.68         | 149.84       | 1.34         |
|               | Within  | 64                 | 7167.80        | 111.99       |              |
|               | Total   | 66                 | 7467.48        |              |              |
| Treatment DUR | Between | 2                  | 195.10         | 97.55        | 0.92         |
|               | Within  | 64                 | 6780.42        | 105.94       |              |
|               | Total   | 66                 | 6975.52        |              |              |
| Follow-Up DUR | Between | 2                  | 383.37         | 191.68       | 0.74         |
|               | Within  | 64                 | 16501.26       | 257.83       |              |
|               | Total   | 66                 | 16884.63       |              |              |
| Pre-test INT  | Between | 2                  | 3.03           | 1.52         | 0.25         |
|               | Within  | 64                 | 388.45         | 6.07         |              |
|               | Total   | 66                 | 391.49         |              |              |
| Treatment INT | Between | 2                  | 79.68          | 39.84        | 7.49 ***     |
|               | Within  | 64                 | 340.41         | 5.32         |              |
|               | Total   | 66                 | 420.09         |              |              |
| Follow-Up INT | Between | 2                  | 1.71           | 0.86         | 0.18         |
|               | Within  | 64                 | 311.43         | 4.87         |              |
|               | Total   | 66                 | 313.14         |              |              |

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .005$

$p = .005$ ) and attack intensity ( $F(2,64) = 7.49, p \leq .005$ ) at the end of treatment indicating that at this point the diaphragmatic breathing exercise group (Tb) was reporting less medication usage and less intense asthmatic attacks than both the exercise group (Te) and control group (C) ( $p = .05$ ). Note, however, that these treatment effects disappeared by the end of follow-up (Figures 1 and 3).

The second MANOVA, with repeated measures related to Hypothesis I, was a 3 (conditions) x 3 (time periods), with 10 asthma symptom clusters as the dependent variables.

The main effect for time (across the repeated measures) was significant at the .05 level of probability (Table 3). There were no significant differences between the three groups nor any significant interaction effect.

Given the above findings, a series of repeated measure MANOVAs (on the sample population x 3 time periods) was performed on each of the 10 asthma symptom clusters. The purpose for this procedure was to determine which symptom clusters were contributing to the MANOVA findings of a main time effect. Table 4 summarizes the findings. As is shown, nine out of 10 clusters decreased significantly from pre-test to follow-up for the three conditions as a whole. The cluster hyperventilation did not change significantly over time for the sample population.

Figures 1, 2, and 3 illustrate the changes in medication level, attack duration, and attack intensity in the three conditions across the treatment and follow-up periods. Figure 4 illustrates the

changes in the 10 asthmatic symptoms over time for the entire sample population, as no differential treatment effects were found.

Table 3

Summary of MANOVA with Ten Asthma Symptom Clusters

| Source            | Calculated Values                            | Probability > F |
|-------------------|----------------------------------------------|-----------------|
| Conditions        | $\hat{\lambda} = .746$<br>$F(18, 112) = .98$ | 0.4840          |
| Repeated Measures | $\hat{\lambda} = .531$<br>$F(18, 47) = 2.31$ | 0.0112          |
| Interaction       | $\hat{\lambda} = .566$<br>$F(36, 94) = .86$  | 0.6917          |

Multivariate Statistic Used: Wilk's Lambda Criterion ( $\hat{\lambda}$ )

Table 4

Summary of Repeated Measures MANOVAs on Each of the  
 Ten Asthma Symptom Clusters for Time Effects

| Variable         | Calculated Values |         | Probability > F |
|------------------|-------------------|---------|-----------------|
| Panic - Fear     | $\Lambda$         | = .714  |                 |
|                  | F(2,63)           | = 12.60 | 0.0001          |
| Irritability     | $\Lambda$         | = .852  |                 |
|                  | F(2,63)           | = 5.48  | 0.0064          |
| Fatigue          | $\Lambda$         | = .827  |                 |
|                  | F(2,63)           | = 6.59  | 0.0025          |
| Hyperventilation | $\Lambda$         | = .915  |                 |
|                  | F(2,63)           | = 2.93  | 0.0609          |
| Dyspnea          | $\Lambda$         | = .677  |                 |
|                  | F(2,63)           | = 15.00 | 0.0001          |
| Congestion       | $\Lambda$         | = .833  |                 |
|                  | F(2,63)           | = 6.33  | 0.0031          |
| Worry            | $\Lambda$         | = .706  |                 |
|                  | F(2,63)           | = 13.10 | 0.0001          |
| Anger            | $\Lambda$         | = .906  |                 |
|                  | F(2,63)           | = 3.29  | 0.0439          |
| Loneliness       | $\Lambda$         | = .853  |                 |
|                  | F(2,63)           | = 5.42  | 0.0067          |
| Rapid Breathing  | $\Lambda$         | = .725  |                 |
|                  | F(2,63)           | = 11.94 | 0.0001          |

Multivariate Statistic Used: Wilk's Lambda Criterion ( $\Lambda$ )

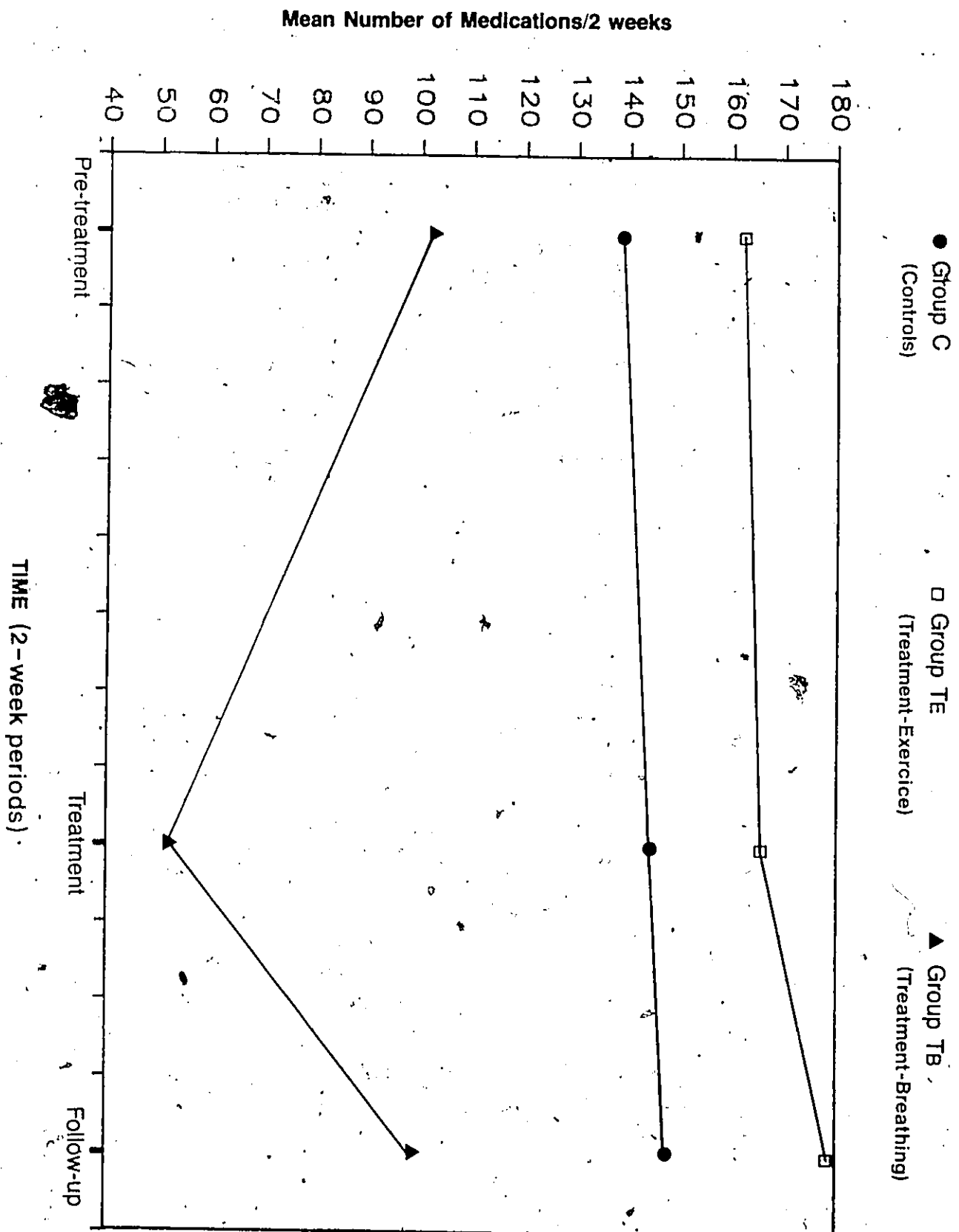


Figure 1. Mean Medication Levels Across Treatment and Follow-up.

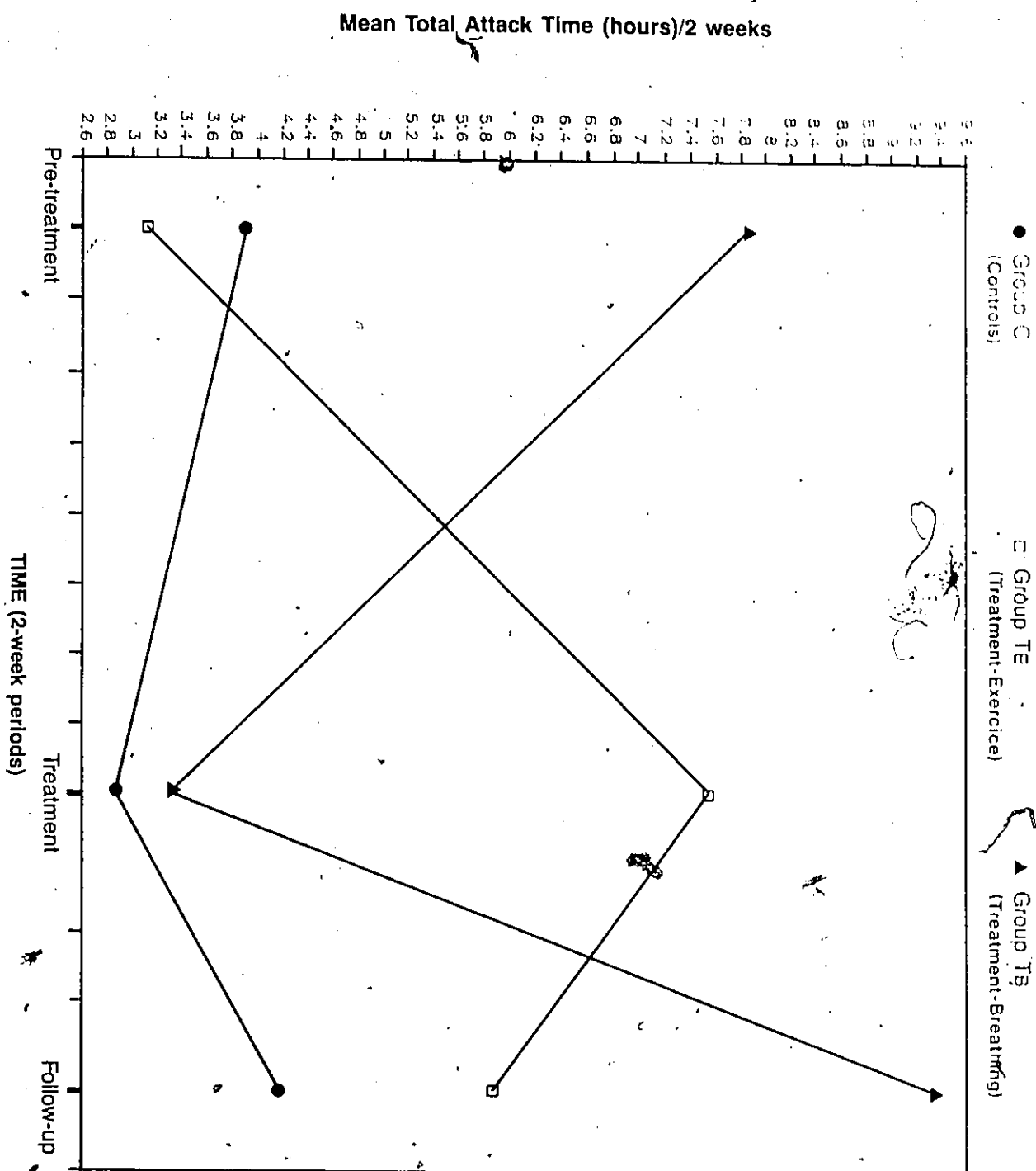


Figure 2. Mean Total Attack Duration Across Treatment and Follow-up

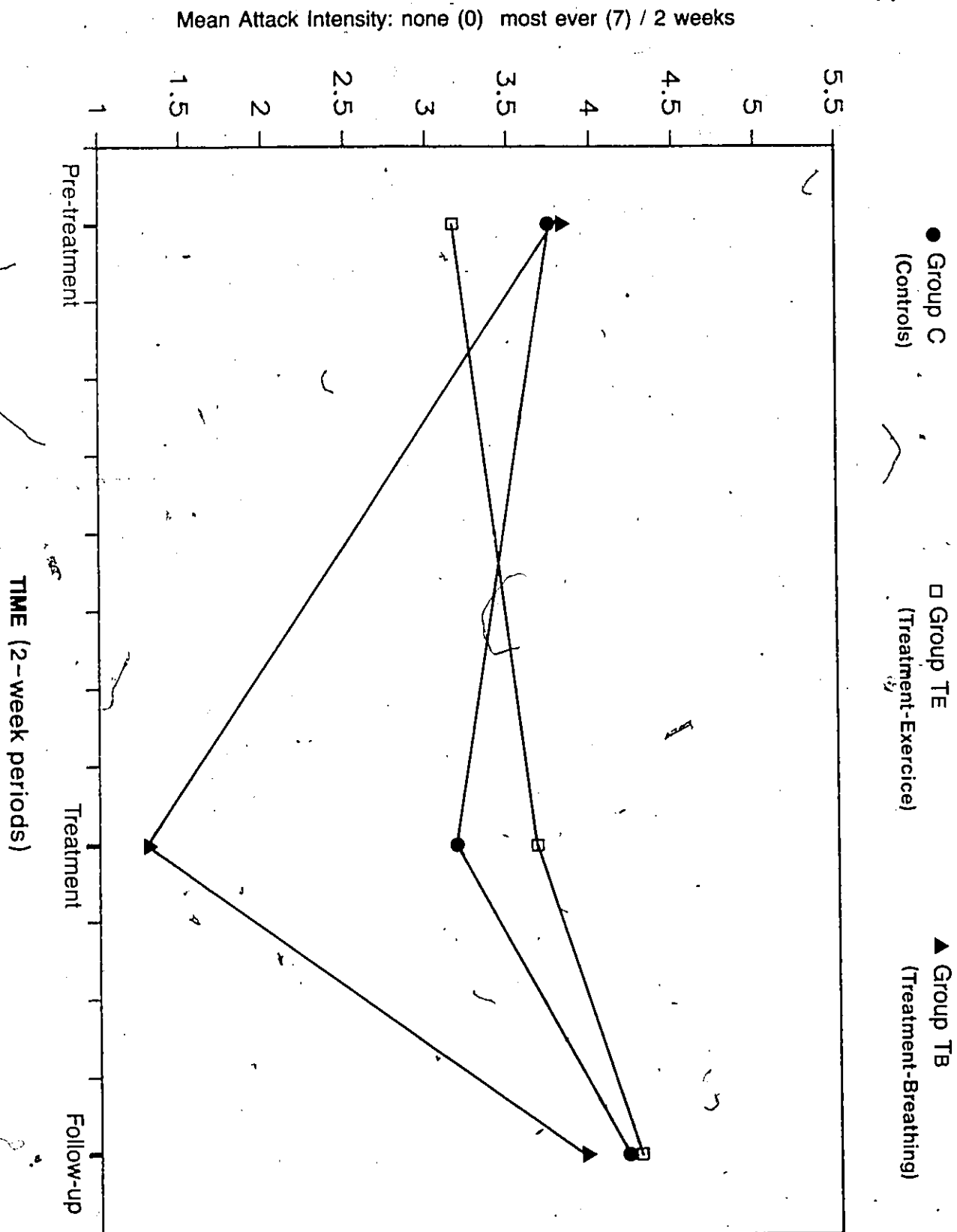


Figure 3. Mean Attack Intensities Across Treatment and Follow-up.

Mean Asthma Symptom Frequency : Never (1) Always (50)

72

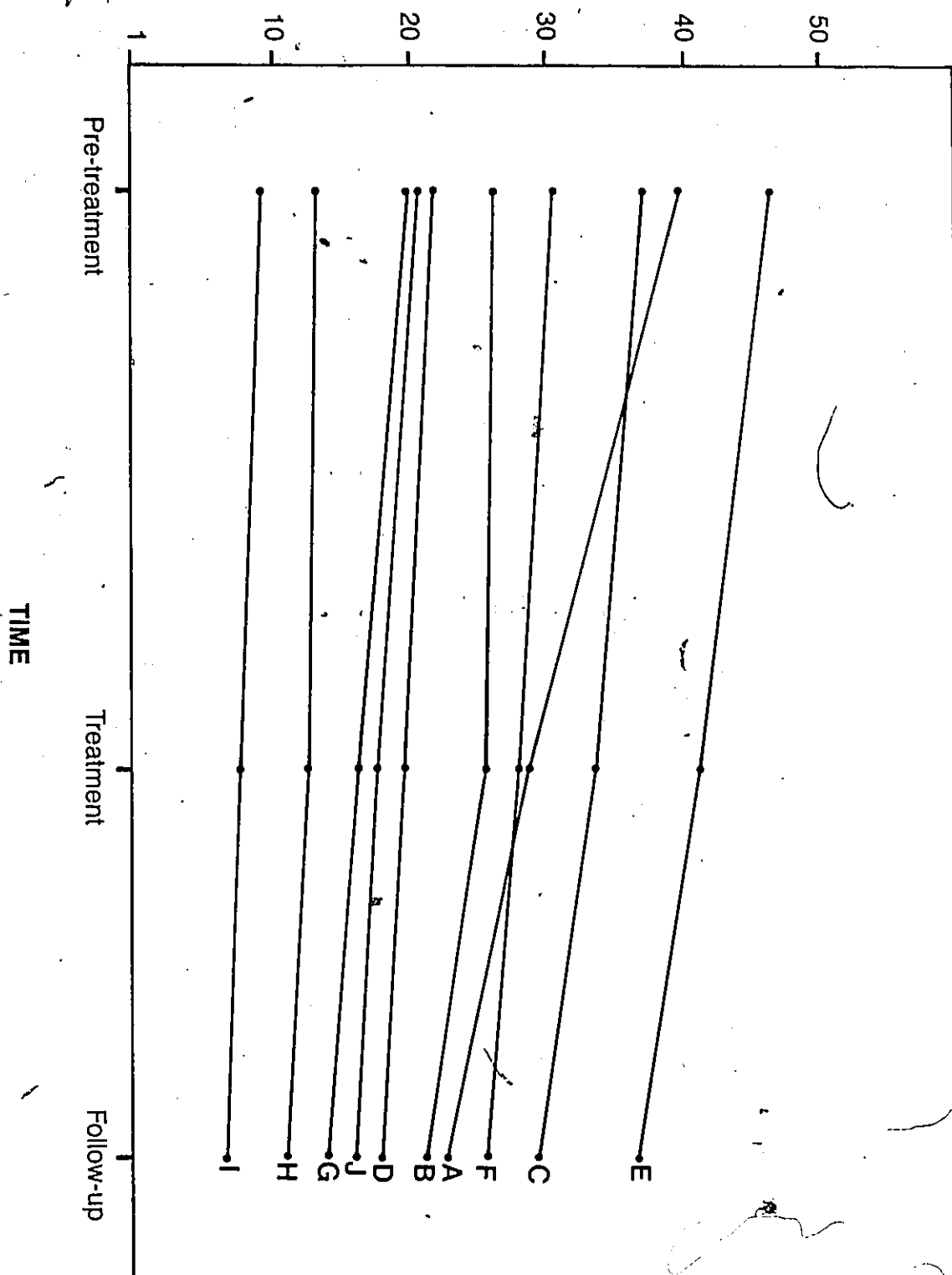


Figure 4. Mean Asthma Symptom Levels Across Treatment and Follow-up for the Entire Sample

B. Re Hypothesis II: "It was hypothesized that the experimental subjects would demonstrate significant improvements in the nine biomedical measures of their physical fitness (three cardiopulmonary and six blood assay measures), compared to the pseudo-training and control subjects."

Biomedical Fitness Treatment Effects:

A 2 (conditions) x 2 (time periods) repeated measures MANOVA, with nine dependent variables, was performed to test Hypothesis II. The two conditions were: 1) Group Tb (diaphragmatic breathing exercise) and 2) Groups Te (exercise only) and C (control) combined. Groups Te and C were combined for this analysis for two reasons: (1) A comparison between the diaphragmatic breathing treatment program (Group Tb) and all other conditions combined (Groups Te and C) was sought on the biomedical measures, and (2) a MANOVA procedure would eliminate subjects with missing data and reduce groups Tb, Te, and C to n's of 13, 4, and 7 respectively - making any three group comparisons highly unreliable. The data collected at pre-test (post-exercise) and treatment (post-exercise) were analyzed for all nine dependent variables.

The main differences between the two investigative conditions were significant at the .005 level of probability (Table 5). There was also a significant interaction between the condition effect and the repeated measures (time) effect ( $p \leq .001$ ).

Table 5

Summary of MANOVA with Nine Biomedical Measures  
of Fitness

| Source            | Calculated Values                    | Probability > F |
|-------------------|--------------------------------------|-----------------|
| Conditions        | $\Lambda = .278$<br>$F(8,15) = 4.88$ | 0.0041          |
| Repeated Measures | $\Lambda = .463$<br>$F(8,15) = 2.18$ | 0.0921          |
| Interaction       | $\Lambda = .184$<br>$F(8,15) = 8.32$ | 0.0003          |

Multivariate Statistic Used: Wilk's Lambda Criterion ( $\Lambda$ )

A series of repeated measures one-way ANOVAs on each of the nine dependent variables was performed as a post-hoc to the above MANOVA.

Table 6 summarizes the findings. As is shown, group differences were found for Vital Capacity (VC) ( $F(1,25) = 6.20, p \leq .05$ ), Maximal Heart Rate (MHR) ( $F(1,26) = 26.62, (p \leq .005)$ ), and Lactic Acid (LA) ( $F(1,26) = 5.96, p \leq .05$ ) at pre-test, and Pyruvic Acid (PA) ( $F(1,26) = 8.32, p \leq .01$ ) at treatment.

A series of one-way ANCOVAs on each of the dependent measures indicating pre-test differences, was performed as a post-hoc to the above ANOVA findings. Using the pre-test measure as the covariate, no significant difference between groups at treatment was found for Vital Capacity ( $F(1,35) = 0.94, p = .339$ ), Maximal Heart Rate ( $F(1,25) = 0.247, p = .622$ ) or Lactic Acid ( $F(1,35) = 1.406, p = .244$ ).

Post-hoc Schéffe tests on the above indicated the following:

1) The treatment group (Tb) had a significantly lower VC than the combined group (Te and C) at pre-test; 2) the treatment group had higher MHR and LA levels than the combined group at pre-test; and 3) the treatment group had higher PA levels than the combined group at post-treatment ( $p \leq .05$ ).

Figures 5 to 13 inclusively illustrate the changes in the nine biomedical measures in the two conditions across the pre-test and treatment periods.

Table 6

Summary of Repeated Measures One-Way ANOVAs on the Nine  
Biomedical Measures of Fitness at Each Time Period

| Variable       | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|----------------|---------|--------------------|----------------|--------------|--------------|
| Pre-test VC    | Between | 1                  | 4178240.74     | 4178240.74   | 6.20 *       |
|                | Within  | 25                 | 16857633.33    | 674305.33    |              |
|                | Total   | 26                 | 21035874.07    |              |              |
| Treatment VC   | Between | 1                  | 177489.07      | 177489.07    | 0.22         |
|                | Within  | 25                 | 20544451.67    | 821778.07    |              |
|                | Total   | 26                 | 20721940.74    |              |              |
| Pre-test FEV   | Between | 1                  | 3234816.00     | 3234816.00   | 3.46         |
|                | Within  | 23                 | 21531200.00    | 936139.13    |              |
|                | Total   | 24                 | 24766016.00    |              |              |
| Treatment FEV  | Between | 1                  | 3453.56        | 3453.56      | 0.00         |
|                | Within  | 23                 | 18787522.44    | 816848.80    |              |
|                | Total   | 24                 | 18790976.00    |              |              |
| Pre-test MHR   | Between | 1                  | 5500.07        | 5500.07      | 26.62 ***    |
|                | Within  | 26                 | 5371.64        | 206.60       |              |
|                | Total   | 27                 | 10871.71       |              |              |
| Treatment MHR  | Between | 1                  | 33.39          | 33.39        | 0.17         |
|                | Within  | 26                 | 4975.86        | 191.38       |              |
|                | Total   | 27                 | 5009.25        |              |              |
| Pre-test PH    | Between | 1                  | 0.0020         | 0.0020       | 0.95         |
|                | Within  | 26                 | 0.0534         | 0.0021       |              |
|                | Total   | 27                 | 0.0554         |              |              |
| Treatment PH   | Between | 1                  | 0.0001         | 0.0001       | 0.08         |
|                | Within  | 26                 | 0.0182         | 0.0007       |              |
|                | Total   | 27                 | 0.0182         |              |              |
| Pre-test BASE  | Between | 1                  | 1.56           | 1.56         | 1.03         |
|                | Within  | 26                 | 39.30          | 1.51         |              |
|                | Total   | 27                 | 40.86          |              |              |
| Treatment BASE | Between | 1                  | 1.23           | 1.23         | 1.90         |
|                | Within  | 26                 | 16.83          | 0.65         |              |
|                | Total   | 27                 | 18.05          |              |              |

\* p &lt; .05

\*\* p &lt; .01

\*\*\* p &lt; .005

Table 6 (cont'd)

Summary of Repeated Measures One-Way ANOVAs on the Nine  
Biomedical Measures of Fitness at Each Time Period

| Variable      | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|---------------|---------|--------------------|----------------|--------------|--------------|
| Pre-test HTC  | Between | 1                  | 32.98          | 32.98        | 2.00         |
|               | Within  | 27                 | 444.56         | 16.47        |              |
|               | Total   | 28                 | 477.54         |              |              |
| Treatment HTC | Between | 1                  | 8.43           | 8.43         | 0.07         |
|               | Within  | 27                 | 347.81         | 12.88        |              |
|               | Total   | 28                 | 356.24         |              |              |
| Pre-test HB   | Between | 1                  | 1.85           | 1.85         | 0.74         |
|               | Within  | 27                 | 67.40          | 2.50         |              |
|               | Total   | 28                 | 69.25          |              |              |
| Treatment HB  | Between | 1                  | 0.43           | 0.43         | 0.26         |
|               | Within  | 27                 | 44.46          | 1.65         |              |
|               | Total   | 28                 | 44.89          |              |              |
| Pre-test LA   | Between | 1                  | 621.60         | 621.60       | 5.96 *       |
|               | Within  | 26                 | 2712.80        | 104.34       |              |
|               | Total   | 27                 | 3334.40        |              |              |
| Treatment LA  | Between | 1                  | 11.30          | 11.30        | 0.09         |
|               | Within  | 26                 | 3184.38        | 122.48       |              |
|               | Total   | 27                 | 3195.69        |              |              |
| Pre-test PA   | Between | 1                  | 0.58           | 0.58         | 3.82         |
|               | Within  | 26                 | 3.92           | 0.15         |              |
|               | Total   | 27                 | 4.50           |              |              |
| Treatment PA  | Between | 1                  | 0.64           | 0.64         | 8.32 **      |
|               | Within  | 26                 | 1.99           | 0.08         |              |
|               | Total   | 27                 | 2.63           |              |              |

\* p &lt; .05

\*\* p &lt; .01

\*\*\* p &lt; .005

Mean Vital Capacity (litres)

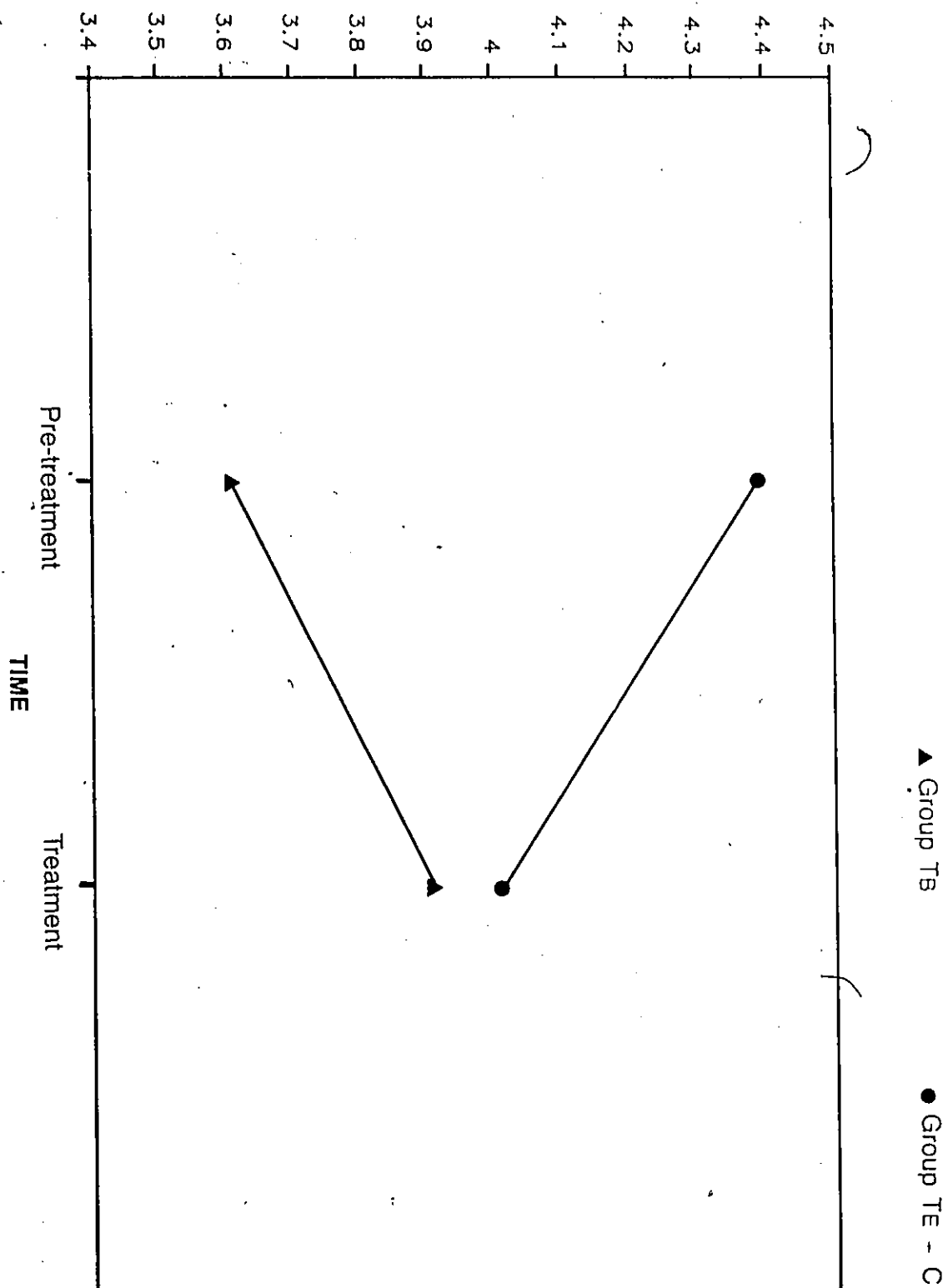


Figure 5. Mean Vital Capacity Across Time.

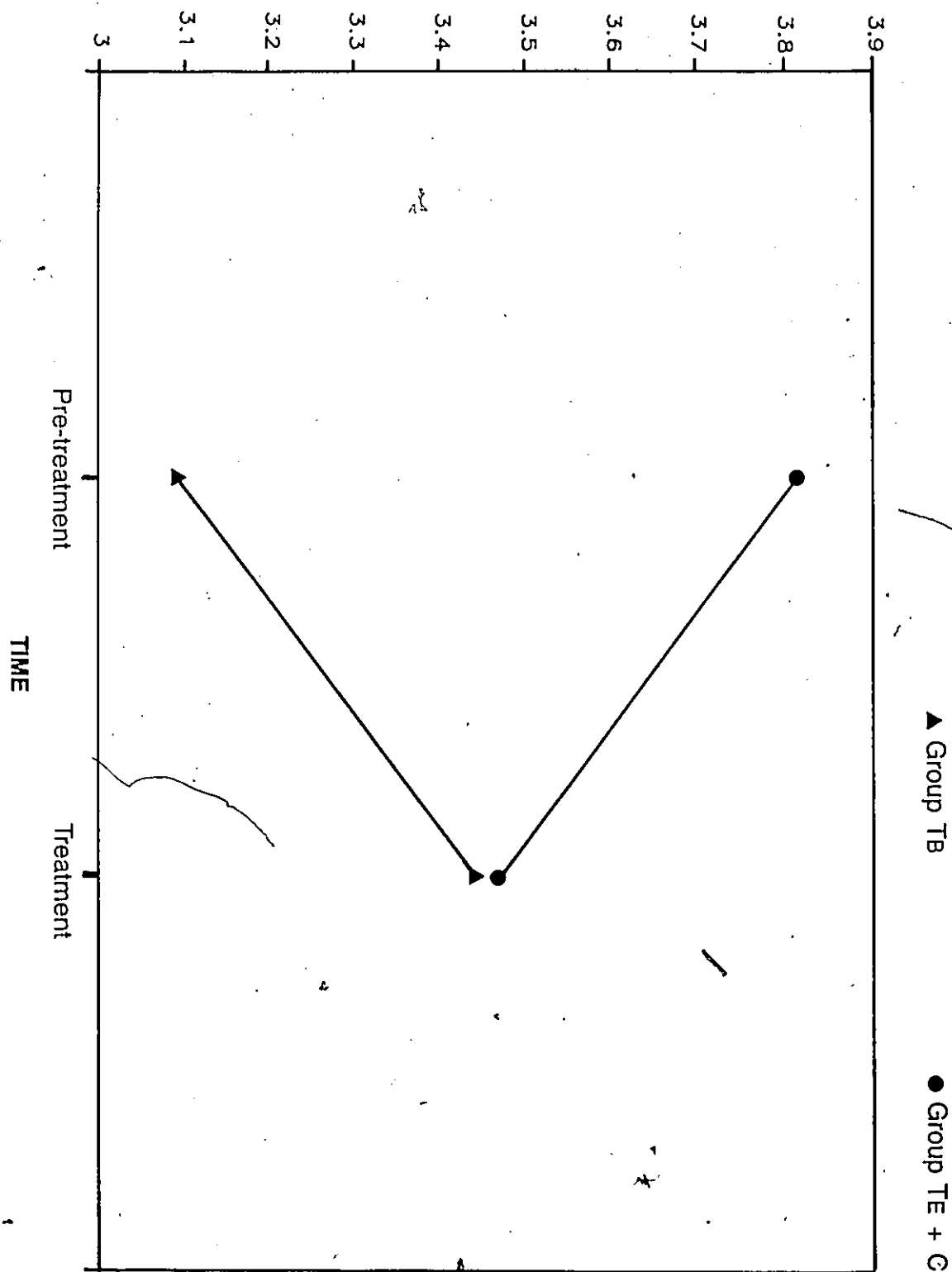


Figure 6. Mean Forced Expiratory Volumes Across Time.

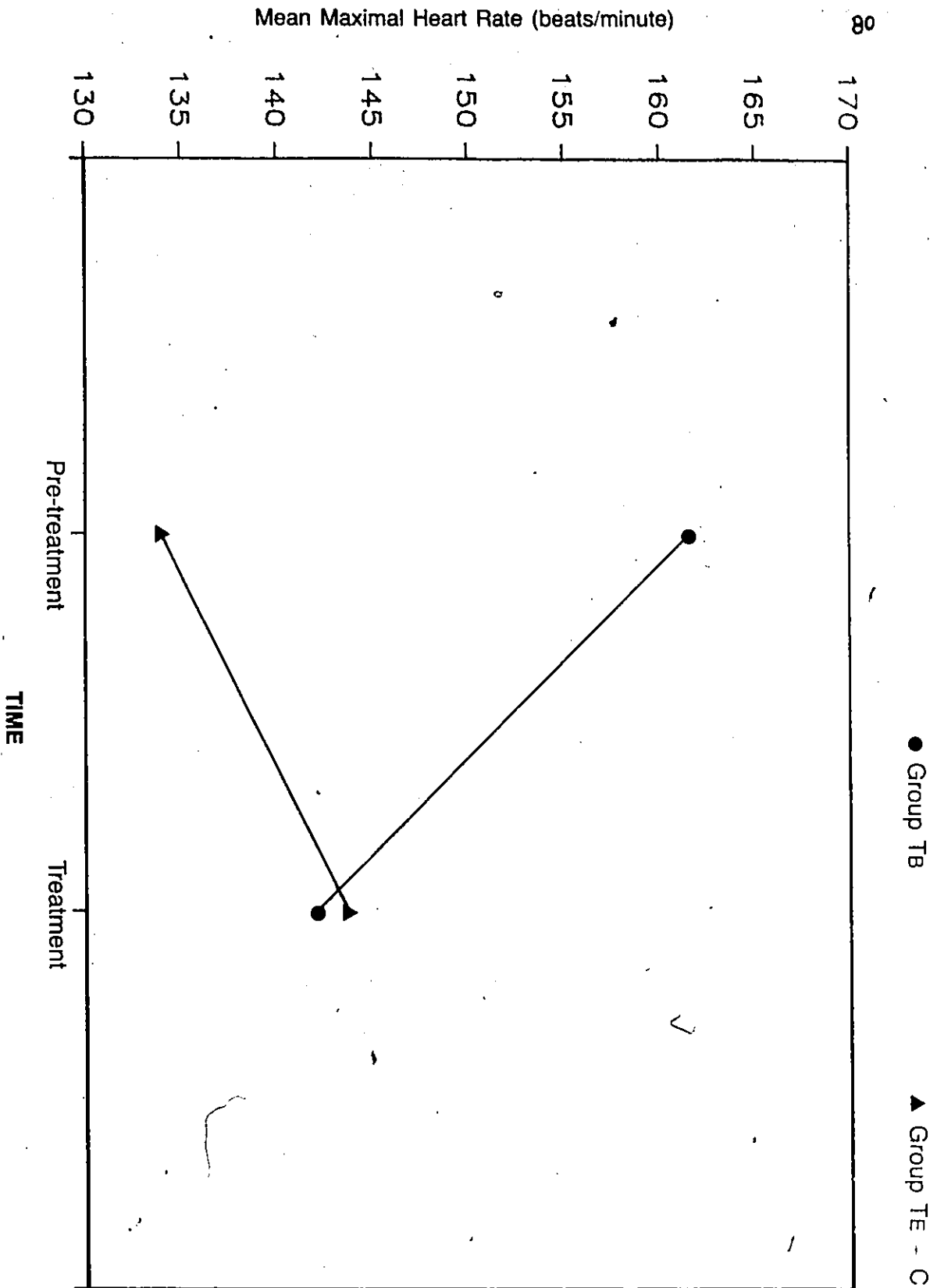


Figure 7. Mean Maximal Heart Rate Across Time.

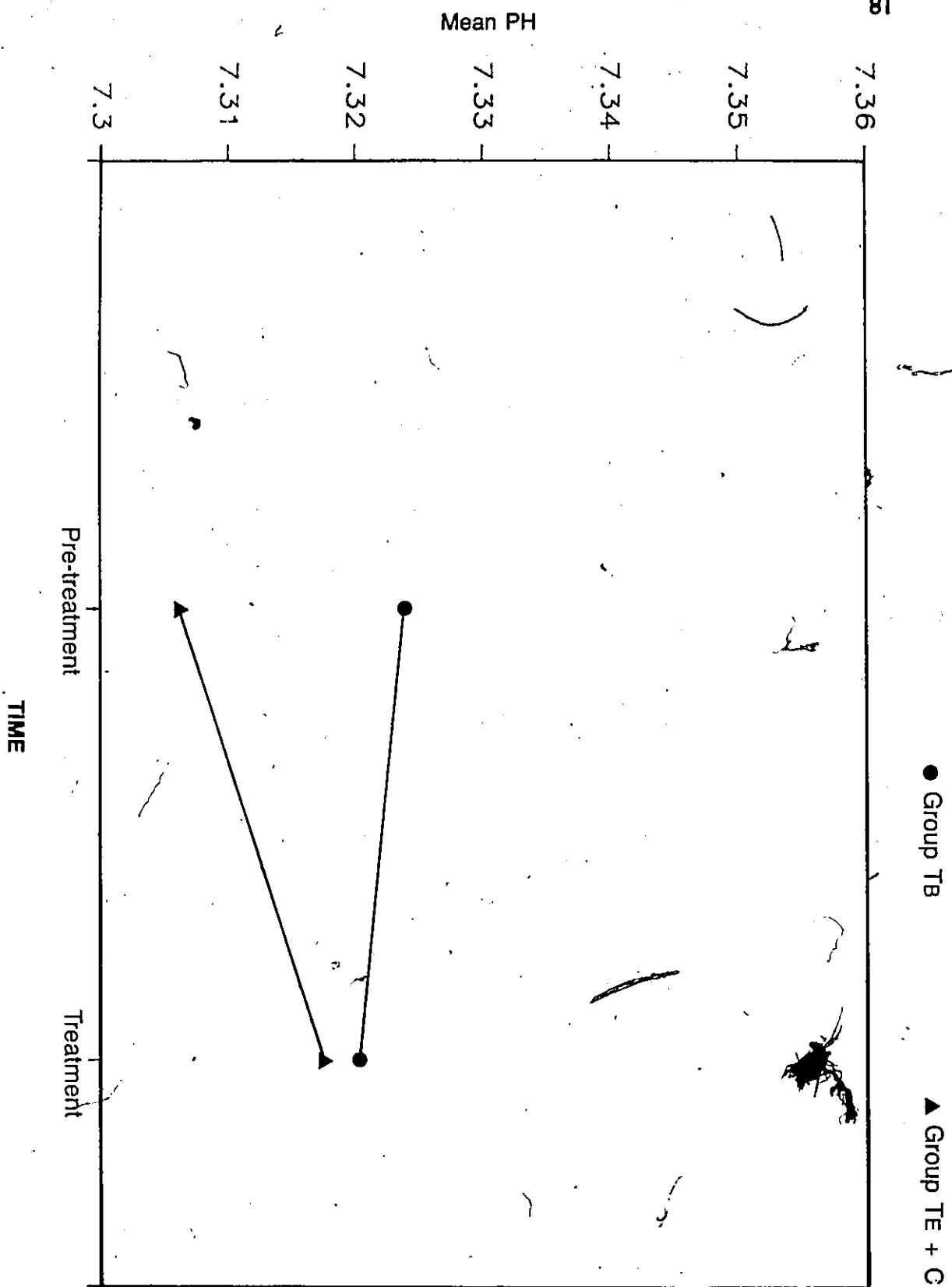


Figure 8. Mean PH Levels Across Time.

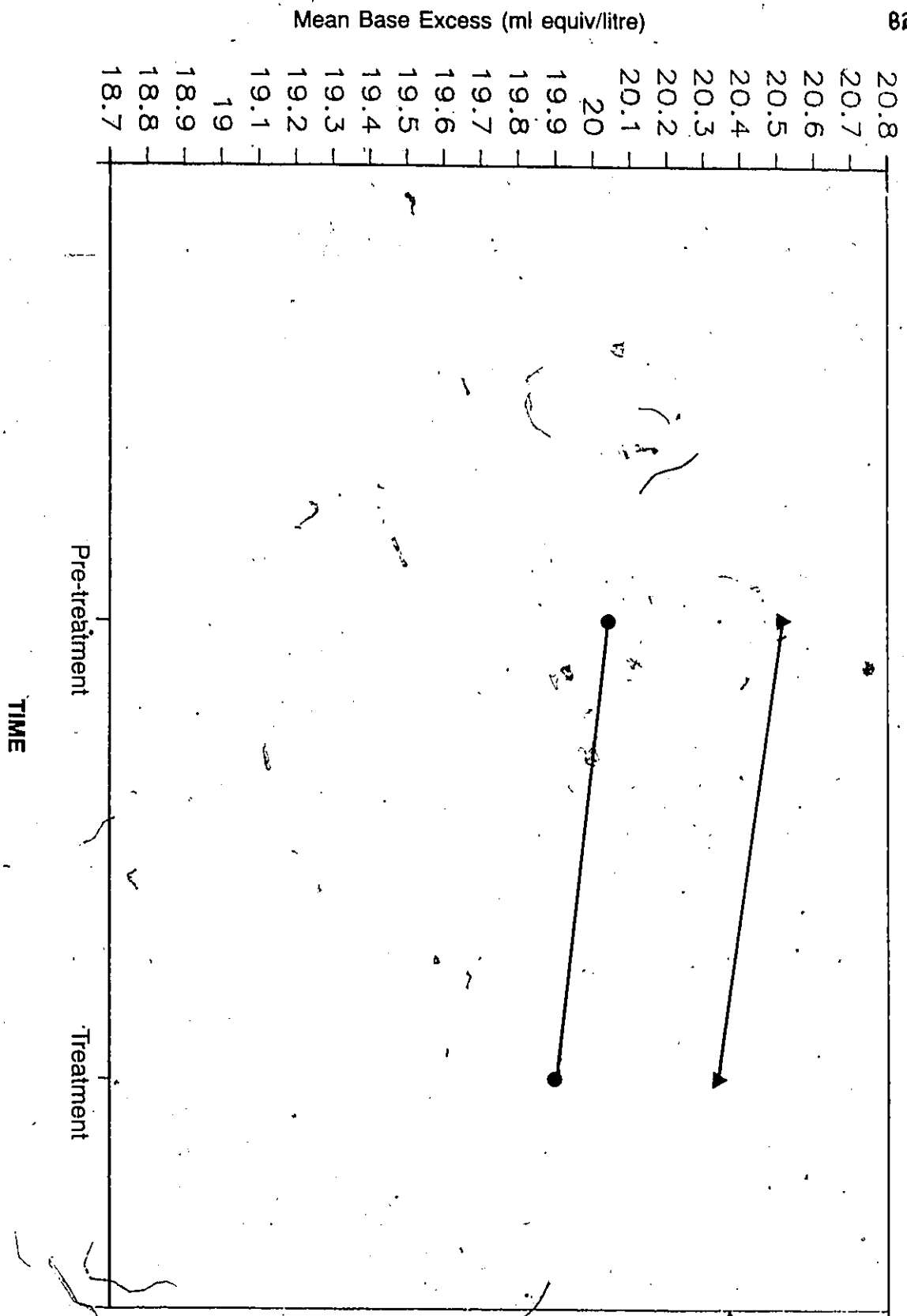


Figure 9. Mean Base Excess Levels Across Time.

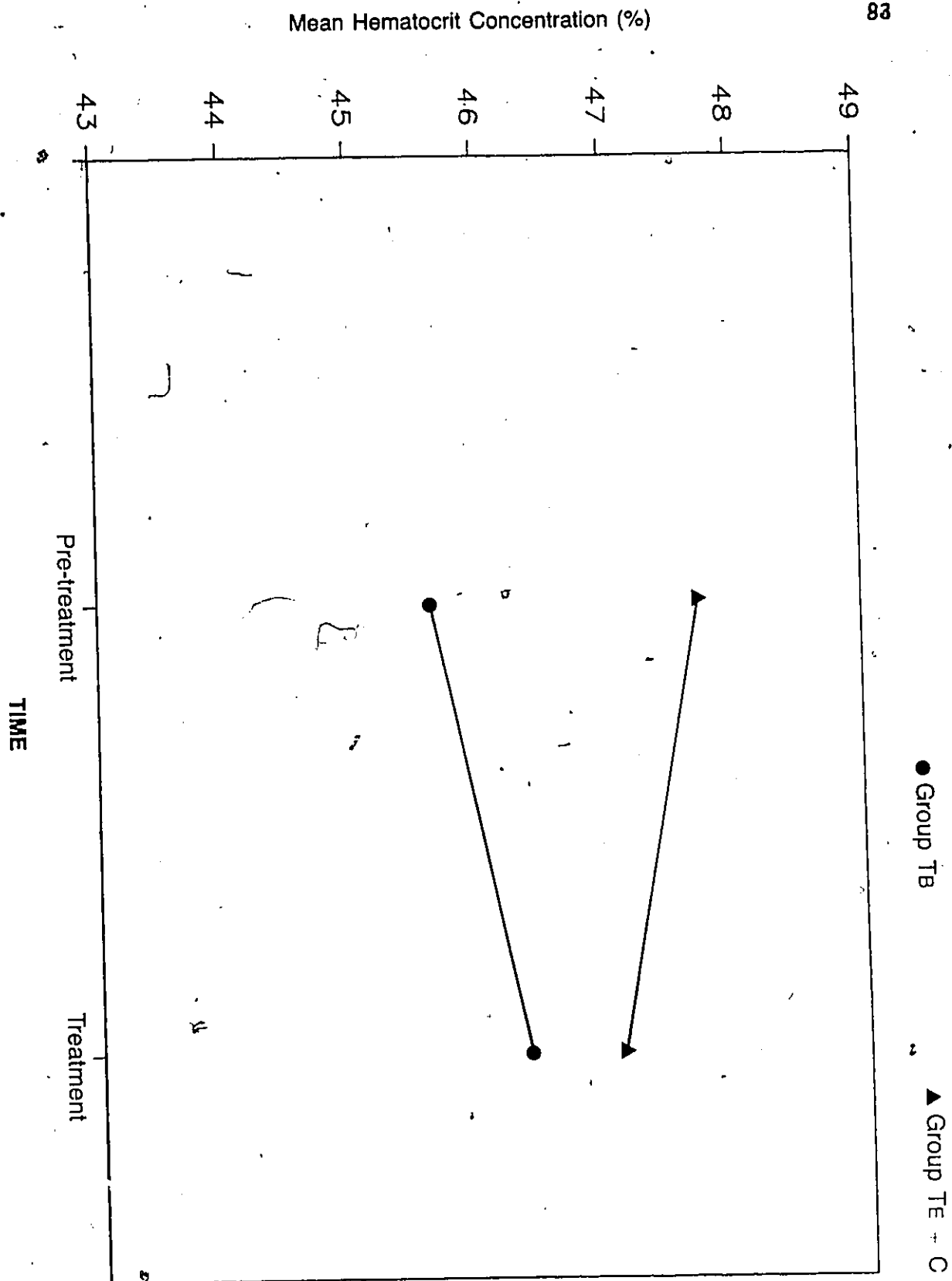


Figure 10. Mean Hematocrit Levels Across Time.

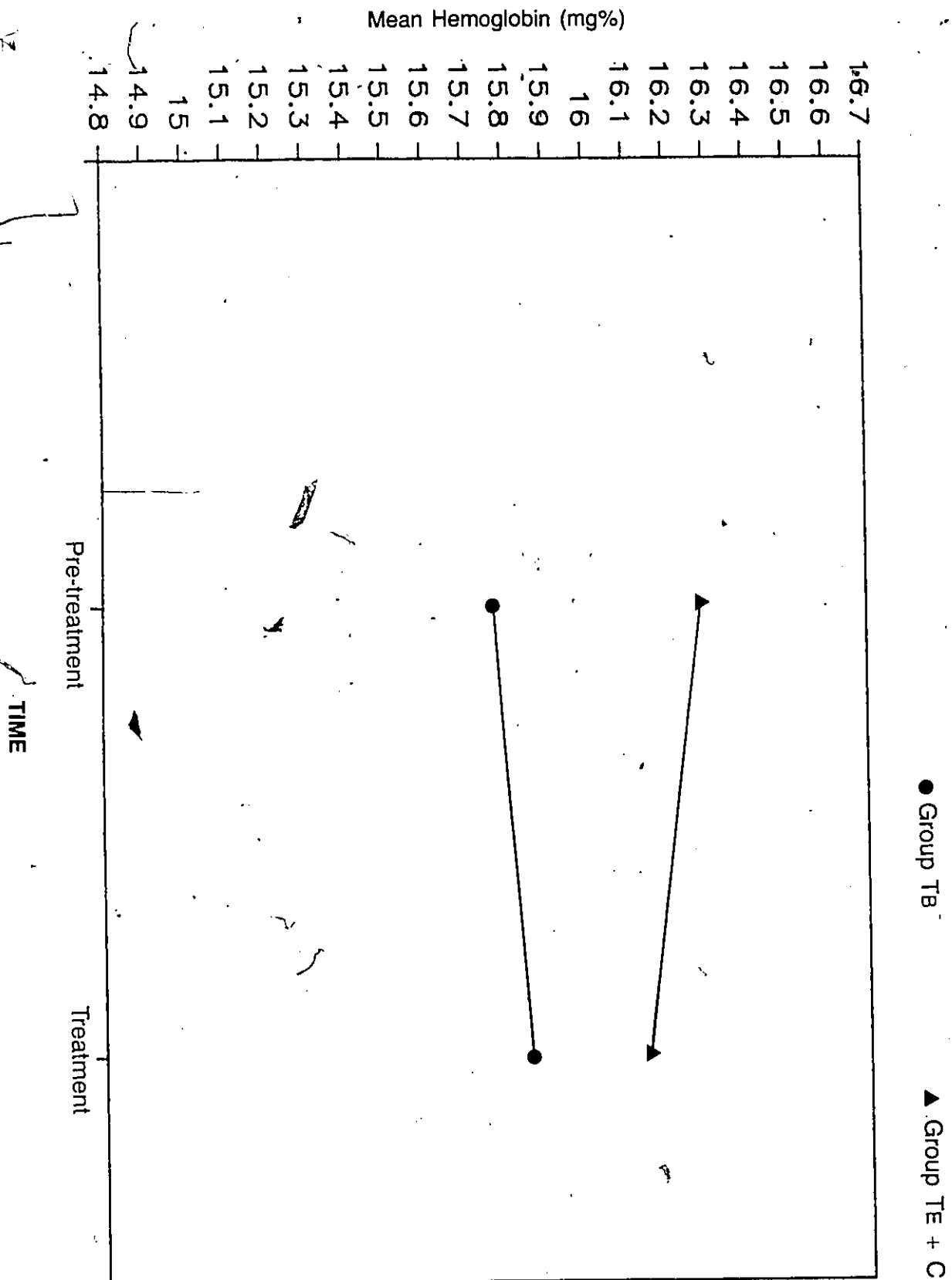


Figure 11. Mean Hemoglobin Levels Across Time.

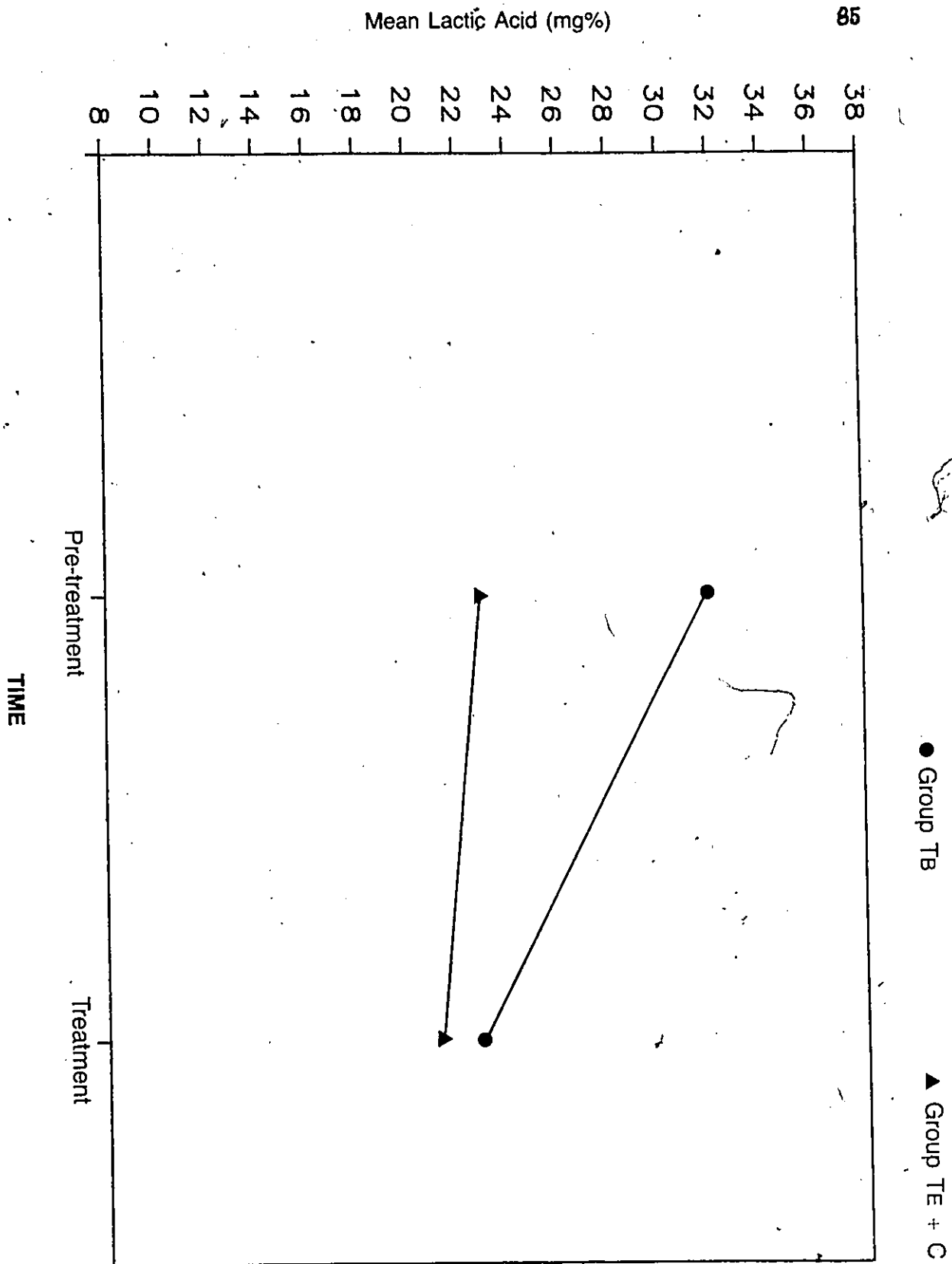


Figure 12: Mean Lactic Acid Levels Across Time.

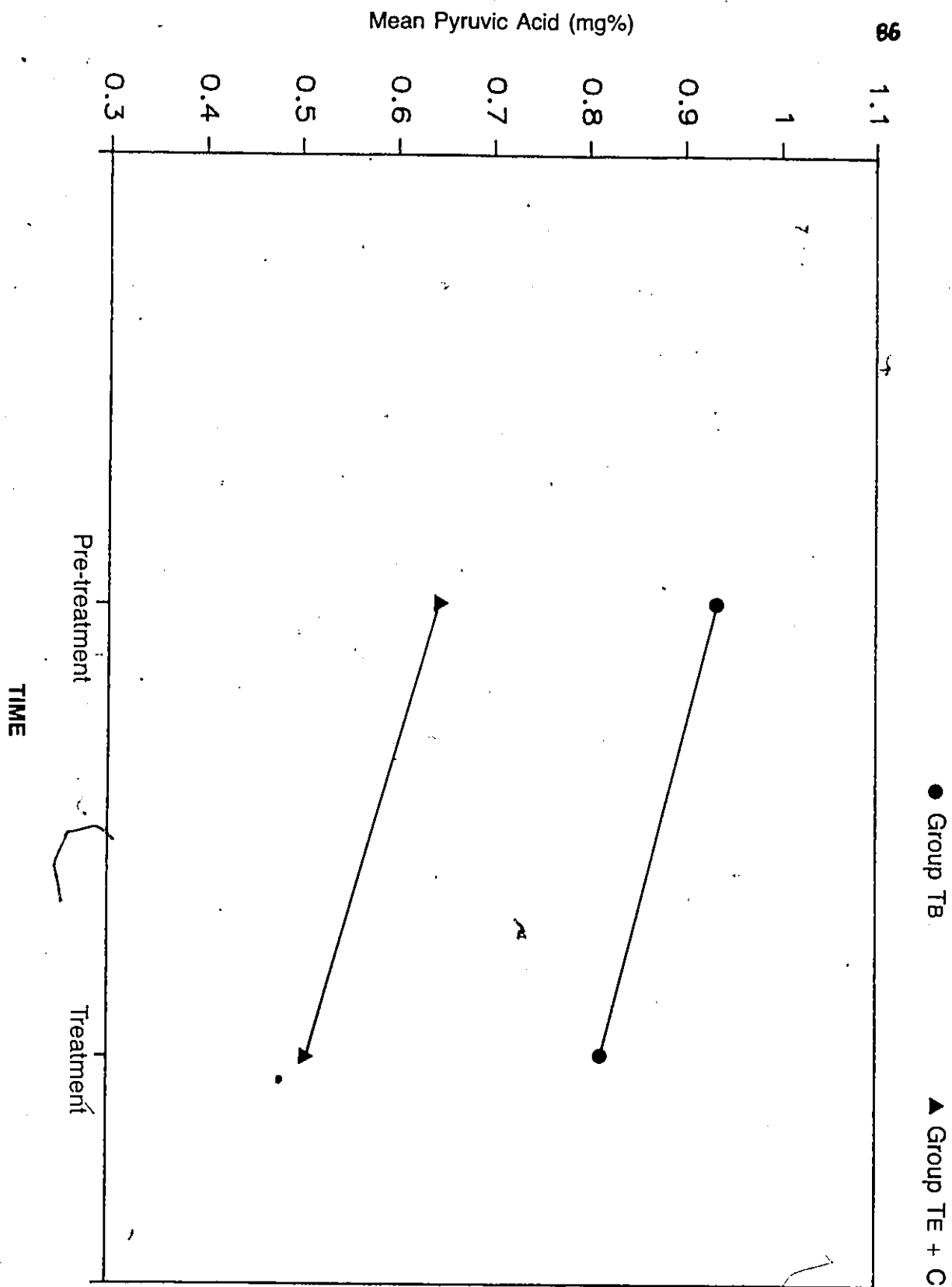


Figure 13. Mean Pyruvic Acid Levels Across Time.

C. Re Hypothesis III: "It was hypothesized that the experimental subjects would report significant increases in the recreational and/or social activity level (recreational and social activity measures), compared to the pseudo-training and control subjects."

Recreational and/or Social Treatment Effects:

A 3 (conditions) x 3 (time periods) repeated measures MANOVA with Physical Activity Level (Phy-Act) and Social Activity Level (Soc-Act) as the dependent variables was performed to test Hypothesis III.

The main effects for conditions as well as across the repeated measures were not significant (Table 7). However, there was a significant interaction between the condition effect and the repeated measures effect ( $p \leq .001$ ).

Given the above finding, a series of repeated measures one-way ANOVAs on each dependent variable (Phy-Act, Soc-Act) was performed to determine which groups, on which dependent variable(s) and at what time period(s), were interacting. Table 8 summarizes the findings. As is shown, group differences were found for both Physical Activity level ( $F(2,64) = 4.43, p \leq .05$ ) and Social Activity level ( $F(2,64) = 8.02, p \leq .005$ ) at pre-test, as well as for Social Activity level ( $F(2,64) = 3.56, p \leq .05$ ) at the end of treatment.

One-way ANCOVAs on physical and social activity levels were performed as a post-hoc to the above ANOVA findings. Using the pre-test measure as the covariate, no significant difference between

Table 7

Summary of MANOVA with Physical and Social  
Activity Levels

| Source            | Calculated Values                            | Probability > F |
|-------------------|----------------------------------------------|-----------------|
| Conditions        | $\hat{\Lambda} = .954$<br>$F(2, 128) = 1.51$ | 0.2249          |
| Repeated Measures | $\hat{\Lambda} = .991$<br>$F(2, 63) = 0.29$  | 0.7480          |
| Interaction       | $\hat{\Lambda} = .659$<br>$F(4, 126) = 7.31$ | 0.0001          |

Multivariate Statistic Used: Wilk's Lambda Criterion ( $\hat{\Lambda}$ )

Table 8

Summary of Repeated Measures One-Way ANOVAs on Physical and  
Social Activity Levels at Each Time Period

| Variable          | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|-------------------|---------|--------------------|----------------|--------------|--------------|
| Pre-test PHY-ACT  | Between | 2                  | 20885.97       | 10442.98     | 4.43 *       |
|                   | Within  | 64                 | 150872.90      | 2357.39      |              |
|                   | Total   | 66                 | 171758.86      |              |              |
| Treatment PHY-ACT | Between | 2                  | 61755.03       | 30877.51     | 3.06         |
|                   | Within  | 64                 | 646565.99      | 10102.59     |              |
|                   | Total   | 66                 | 708321.02      |              |              |
| Follow-Up PHY-ACT | Between | 2                  | 344.62         | 172.31       | 0.04         |
|                   | Within  | 64                 | 305600.18      | 4775.00      |              |
|                   | Total   | 66                 | 305944.81      |              |              |
| Pre-test SOC-ACT  | Between | 2                  | 61027.29       | 30513.64     | 8.02 ***     |
|                   | Within  | 64                 | 243507.29      | 3804.80      |              |
|                   | Total   | 66                 | 304534.56      |              |              |
| Treatment SOC-ACT | Between | 2                  | 124275.15      | 62137.57     | 3.56 *       |
|                   | Within  | 64                 | 1117978.05     | 17468.41     |              |
|                   | Total   | 66                 | 1242253.20     |              |              |
| Follow-Up SOC-ACT | Between | 2                  | 26262.94       | 13131.47     | 3.09         |
|                   | Within  | 64                 | 271994.44      | 4249.91      |              |
|                   | Total   | 66                 | 298257.38      |              |              |

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .005$

groups at treatment was found for Physical Activity ( $F(1,35) = 0.247, p=.622$ ) or Social Activity ( $F(1,35) = 1.944, p=.171$ ) levels. No other significant differences were found. Post-hoc Schéffe tests on both Physical Activity and Social Activity levels at pre-test revealed that the diaphragmatic breathing exercise group (Tb) reported less physical activity than the control group (C), and more social activity than both the exercise Group Te and Group C ( $p \leq .05$ ). A post-hoc Schéffe test on Social Activity level at the end of treatment also revealed that Group Te reported more social activity than Group C ( $p \leq .05$ ). No group differences were found at follow-up.

Figures 14 and 15 illustrate the changes in Physical and Social Activity levels respectively, in the three conditions across the treatment and follow-up periods.

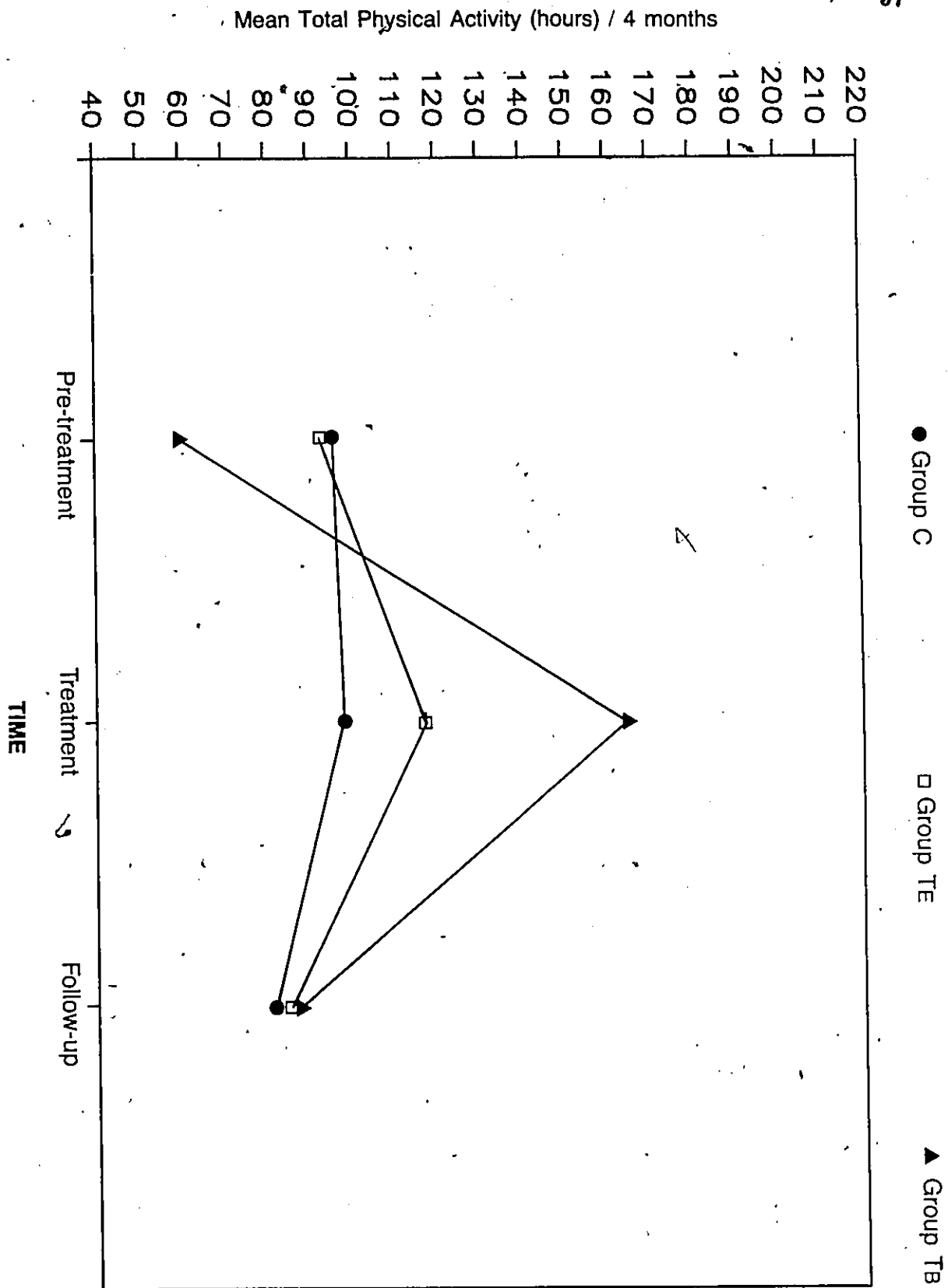


Figure 14. Mean Physical Activity Levels Across Treatment and Follow-up.

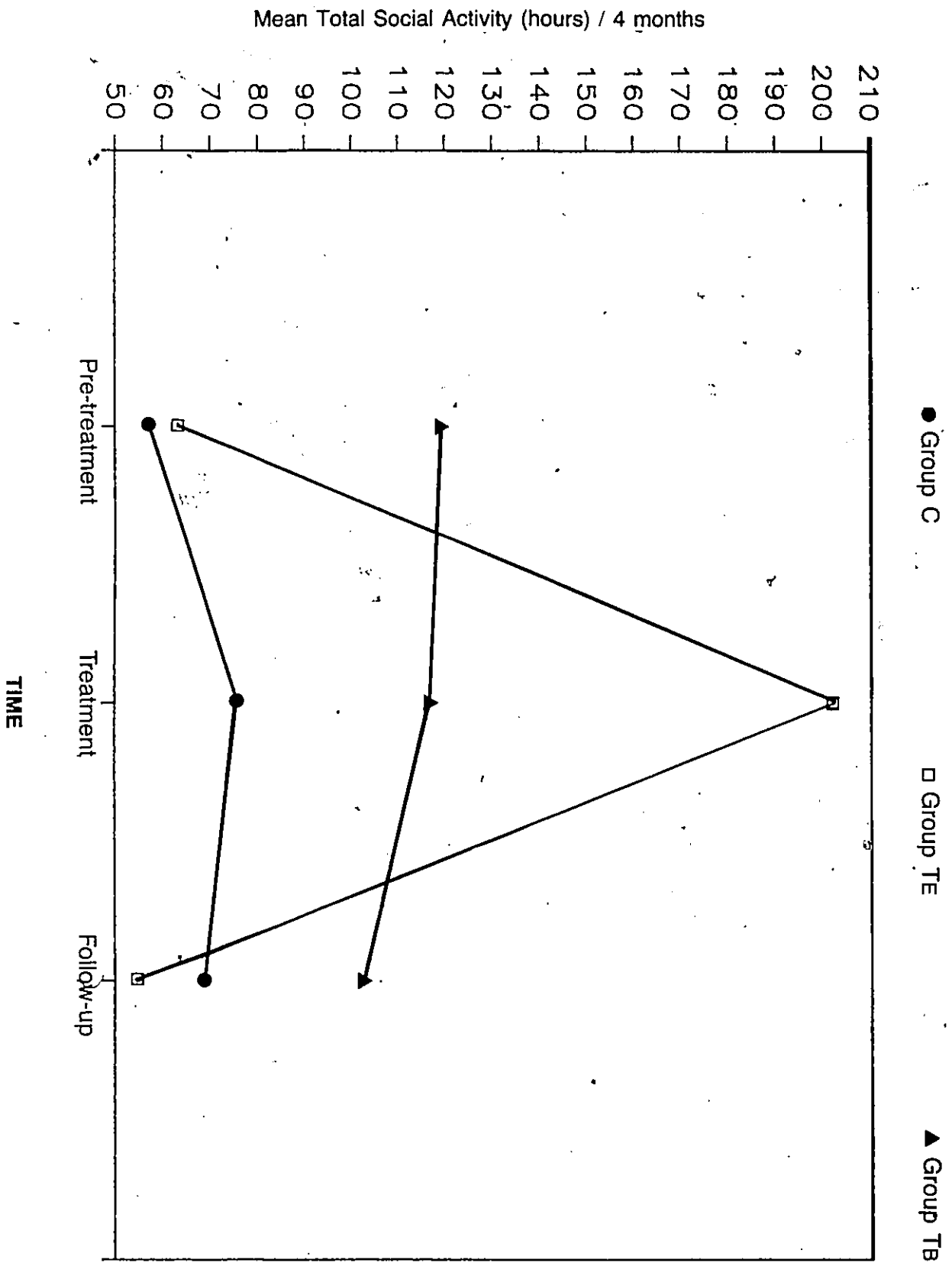


Figure 15. Mean Social Activity Levels Across Treatment and Follow-up.

D. Re Hypothesis IV: "It was hypothesized that the experimental subjects would report a higher level of self-esteem (Rosenberg's (1972) self-esteem scale), compared to the pseudo-training and control subjects."

Self Esteem Treatment Effects:

A 3 (conditions) x 3 (time periods) repeated measures ANOVA on the self-esteem measure failed to yield significant group differences ( $F(2,64) = 0.40, p=.669$ ), or group x time period differences ( $F(4,128) = .50, p=.736$ ). However, a significant Time Period difference ( $F(2,128) = 13.22, p \leq .001$ ) was found. The Time Period results can be clarified by noting that all groups tended to report increases in self-esteem to a similar degree over time, as Figure 16 illustrates.

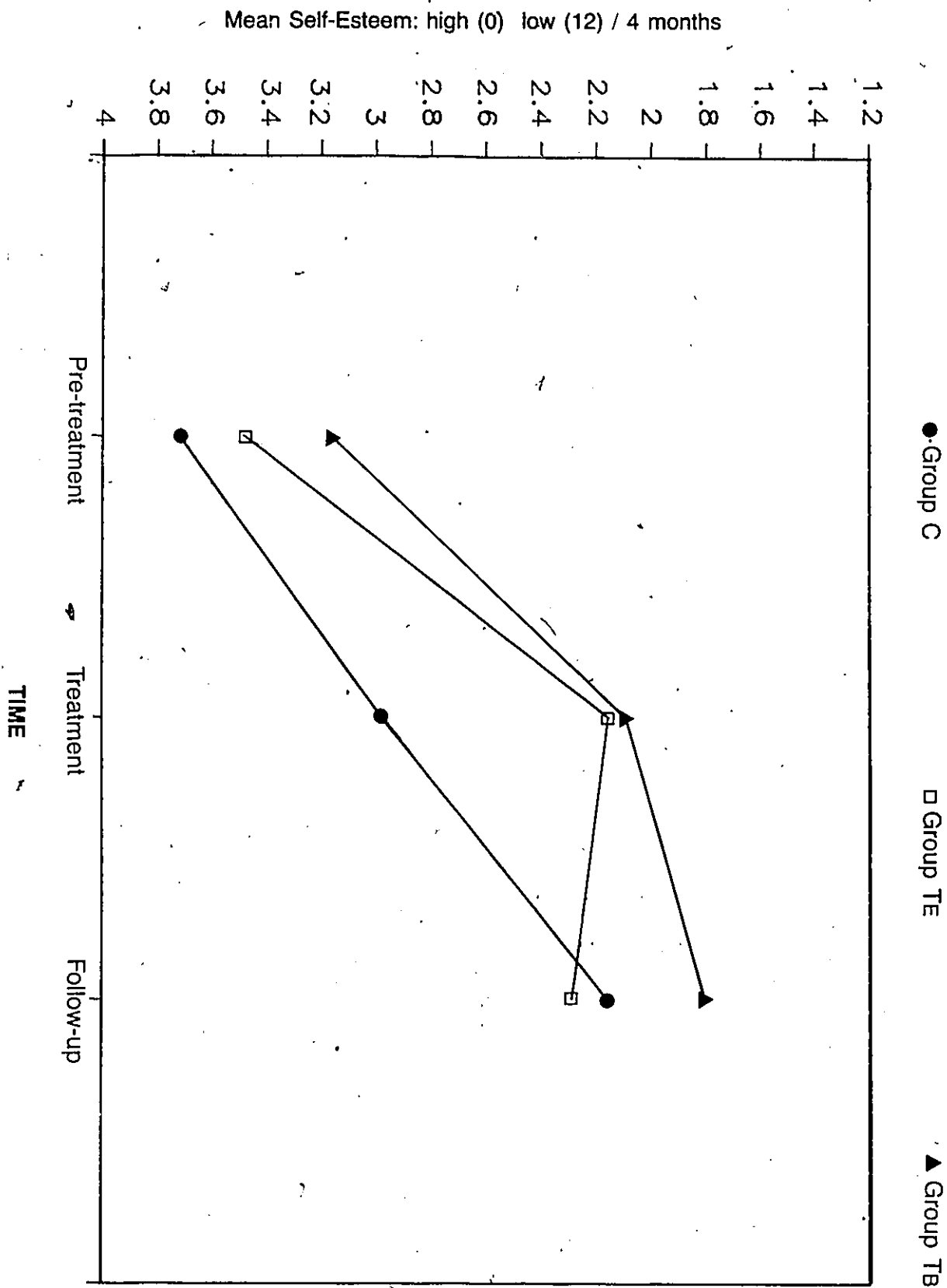


Figure 16. Mean Self-Esteem Levels Across Time

## SOME POST-HOC ISSUES

1. Program Attendance

In order to determine if there existed any differences in attendance to the treatment program between the three groups involved (two groups of diaphragmatic breathing exercise and one group of exercise only), a between-groups ANOVA was performed. No significant difference in attendance between groups was found ( $F(2,43) = 1.104, p = .3413$ ). Table 9 summarizes this ANOVA.

2. Program Expectations

It will be recalled that five questions related to Program Expectations were presented to the three intervention groups (which comprised the two treatment conditions - diaphragmatic breathing exercise and exercise only) at the beginning of the third week of treatment. A series of between-condition ANOVAs was performed and no significant differences in expectations between the diaphragmatic breathing exercise and exercise only conditions were found. Table 10 summarizes these findings.

In order to further explore the potential impact of different instructions on program expectations, a series of between group ANOVAs (comparing all three treatment groups) with post-hoc comparisons were performed and are summarized in Table 11. As shown, a post-hoc Schéffe test revealed that those in Group Tba (diaphragmatic breathing exercise program, with an asthmatic instructor) had a

Table 9

Summary of One-Way ANOVA on Program Attendance

| Variable           | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|--------------------|---------|--------------------|----------------|--------------|--------------|
| Program Attendance | Between | 2                  | 112.67         | 56.33        | 1.10         |
|                    | Within  | 41                 | 2092.48        | 51.04        |              |
|                    | Total   | 43                 | 2205.15        |              |              |

\*  $p < .05$

Table 10

Summary of One-Way ANOVAs on Program Expectations  
 Between the Two Treatment Conditions

| Variable                                | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|-----------------------------------------|---------|--------------------|----------------|--------------|--------------|
| Decrease Attack Frequency               | Between | 2                  | 1.16           | 1.16         | 0.269        |
|                                         | Within  | 41                 | 181.39         | 4.32         |              |
|                                         | Total   | 43                 | 182.55         |              |              |
| Decrease Medication                     | Between | 2                  | 0.0038         | 0.0038       | 0.001        |
|                                         | Within  | 41                 | 296.79         | 7.07         |              |
|                                         | Total   | 43                 | 296.80         |              |              |
| Increase Exercise Tolerance             | Between | 2                  | 2.76           | 2.76         | 0.068        |
|                                         | Within  | 41                 | 169.88         | 4.05         |              |
|                                         | Total   | 43                 | 172.64         |              |              |
| Increase Recreational & Social Activity | Between | 2                  | 0.243          | 0.243        | 0.07         |
|                                         | Within  | 41                 | 144.92         | 3.45         |              |
|                                         | Total   | 43                 | 145.16         |              |              |
| Overall Benefit                         | Between | 2                  | 1.52           | 1.52         | 0.401        |
|                                         | Within  | 41                 | 158.67         | 3.78         |              |
|                                         | Total   | 43                 | 160.18         |              |              |

\*  $p < .05$ \*\*  $p < .01$ \*\*\*  $p < .005$

Table 11

Summary of One-Way ANOVAs on Program Expectations  
 Between the Three Treatment Groups

| Variable                                | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|-----------------------------------------|---------|--------------------|----------------|--------------|--------------|
| Decrease Attack Frequency               | Between | 2                  | 21.66          | 10.83        | 2.76         |
|                                         | Within  | 41                 | 160.89         | 3.92         |              |
|                                         | Total   | 43                 | 182.55         |              |              |
| Decrease Medication                     | Between | 2                  | 17.89          | 8.94         | 1.32         |
|                                         | Within  | 41                 | 278.91         | 6.80         |              |
|                                         | Total   | 43                 | 296.80         |              |              |
| Increase Exercise Tolerance             | Between | 2                  | 28.92          | 14.46        | 4.13 *       |
|                                         | Within  | 41                 | 143.72         | 3.51         |              |
|                                         | Total   | 43                 | 172.64         |              |              |
| Increase Recreational & Social Activity | Between | 2                  | 22.27          | 11.14        | 3.72 *       |
|                                         | Within  | 41                 | 122.89         | 3.00         |              |
|                                         | Total   | 43                 | 145.16         |              |              |
| Overall Benefit                         | Between | 2                  | 34.65          | 17.33        | 5.66 **      |
|                                         | Within  | 41                 | 125.53         | 3.06         |              |
|                                         | Total   | 43                 | 160.18         |              |              |

\*  $p < .05$ \*\*  $p < .01$ \*\*\*  $p < .005$

significantly higher expectation that the program would help them increase their exercise tolerance and social and recreational activities ( $F = 3.59, p \leq .05$ ), compared with Group Tbn (diaphragmatic breathing exercises program, with a non-asthmatic instructor). Finally, a Duncan's test revealed that both Groups Tba and Te (exercise only) compared with Group Tbn, had a significantly higher expectation that the program would have an overall benefit ( $qr = 3.00, p \leq .05$ ).

### 3. Program Evaluation

It will be recalled that the five questions used in the Program Expectations were presented to the three intervention groups at the end of the four months of treatment. Subjects were asked to evaluate the programs's success in helping them deal with their asthma. A series of one-way ANOVAs, with post-hoc comparisons, was performed. These are summarized in Table 12. As is shown, a post-hoc Schéffe test revealed that Group Te had a significantly higher exercise tolerance evaluation than Group Tbn ( $F=3.59, p \leq .05$ ). Figures 17 and 18 illustrate the group means for each expectation and evaluation question.

Table 12

## Summary of One-way ANOVAs on Program Evaluation

| Variable                                 | Source  | Degrees of Freedom | Sum of Squares | Mean Squares | F-test Ratio |
|------------------------------------------|---------|--------------------|----------------|--------------|--------------|
| Decreased Attack Frequency               | Between | 2                  | 25.84          | 12.92        | 2.07         |
|                                          | Within  | 41                 | 256.05         | 6.25         |              |
|                                          | Total   | 43                 | 281.89         |              |              |
| Decreased Medication                     | Between | 2                  | 14.50          | 7.25         | 0.58         |
|                                          | Within  | 41                 | 509.75         | 12.43        |              |
|                                          | Total   | 43                 | 524.25         |              |              |
| Increased Exercise Tolerance             | Between | 2                  | 31.55          | 15.78        | 4.13 *       |
|                                          | Within  | 41                 | 156.70         | 3.82         |              |
|                                          | Total   | 43                 | 188.25         |              |              |
| Increased Recreational + Social Activity | Between | 2                  | 13.60          | 6.80         | 1.39         |
|                                          | Within  | 41                 | 200.95         | 4.90         |              |
|                                          | Total   | 43                 | 214.55         |              |              |
| Overall Benefit                          | Between | 2                  | 18.11          | 9.06         | 1.42         |
|                                          | Within  | 41                 | 262.32         | 6.40         |              |
|                                          | Total   | 43                 | 280.43         |              |              |

\*  $p < .05$ \*\*  $p < .01$ \*\*\*  $p < .005$

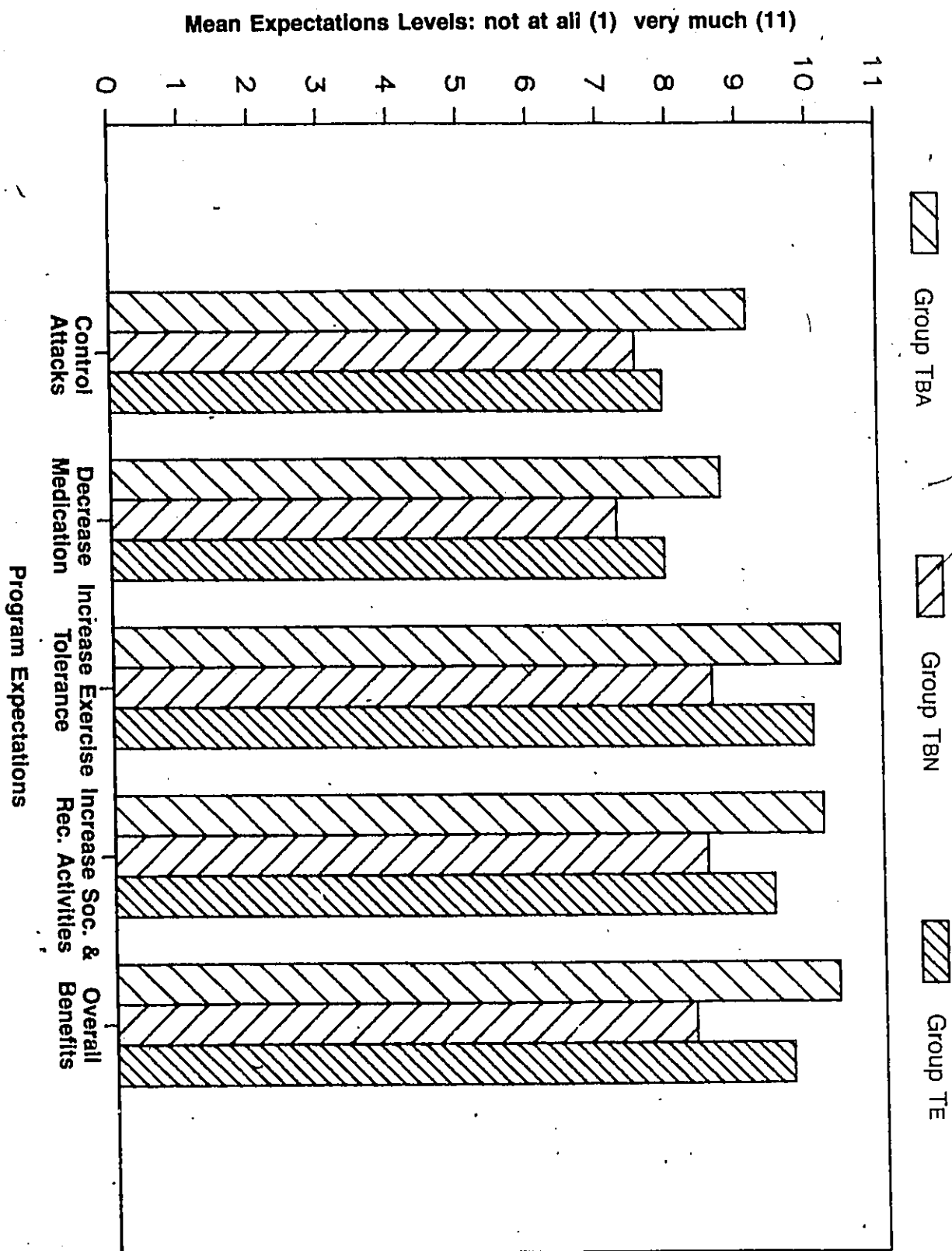


Figure 17. Group Means for Program Expectations.

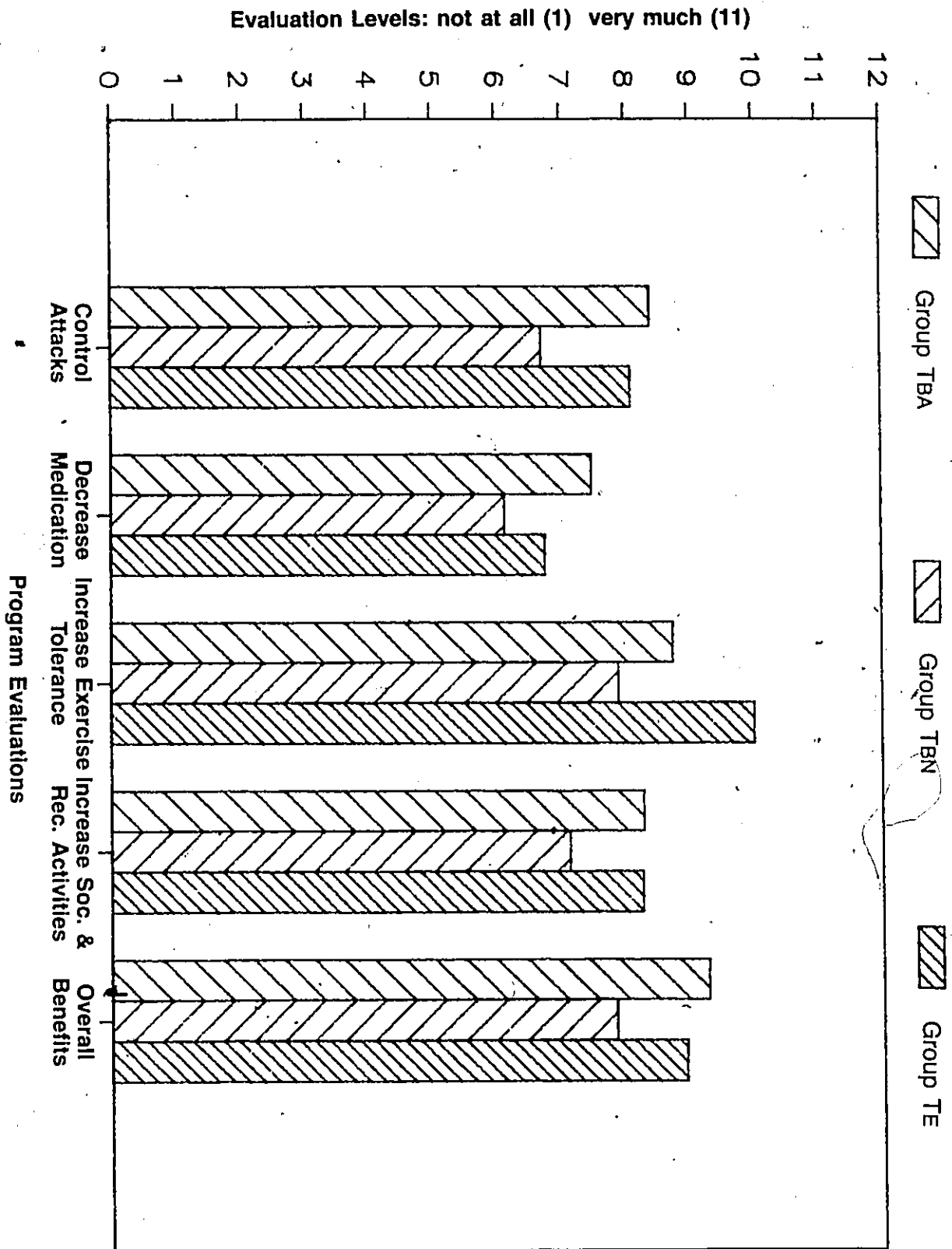


Figure 18. Group Means for Program Evaluation.

## SUMMARY OF RESULTS

Subjects in Group Tb (diaphragmatic breathing) reported decreases in medication level and asthma attack intensity from pre-test to the end of treatment, whereas Groups Te (exercise only) and C (controls) reported no significant change. No treatment effects were found to persist until the end of follow-up. No treatment effects were found for total attack duration. The analyses in terms of the 10 asthma symptom clusters did not reveal any group difference as a result of treatment. It is interesting to note that 9 of the 10 asthma symptom clusters were reported to decrease in frequency, from pre-test through to follow-up, for the three conditions as a whole. The cluster hyperventilation did not change significantly over time for the sample population.

Analyses of the biomedical data indicated three pre-treatment and one post-treatment differences between groups on various measures, as well as an overall interaction. Treatment effects were indicated for four biomedical measures: (1) Group Tb (diaphragmatic breathing) increased in their VC (vital capacity); (2) Group Tb reduced their MHR (maximal heart rate); (3) Group Tb decreased their LA (lactic acid), and (d) Group Tb had a higher PA (pyruvic acid) level than the combined group at post-treatment.

At pre-test, subjects in Group Tb reported being less active physically than Group C, and more active socially than Groups Te and C. By the end of treatment, Group Tb reported similar levels of physical and social activity as Groups Te and C. However, Group Te reported more social activity than Group C. No group differences, on either physical or social activity levels, were found at the end of follow-up.

No treatment effect was observed in the measure for self-esteem, as all groups (including controls) increased in their reported Self-Esteem to a similar degree across the three time periods.

Finally, the three groups involved in the two treatment conditions did not differ significantly in their attendance rates. Differences between groups in terms of Program Expectations generally consisted of Group Tba (diaphragmatic breathing - asthmatic instructor) and Group Te (exercise only) having higher expectations than Group Tbn. In terms of Program Evaluation, Group Te evaluated the program as increasing their exercise tolerance significantly more than did Group Tbn.

7

## CHAPTER IV

Discussion

The specific effects of the Diaphragmatic Breathing Exercise Program (DBEP) on asthma and related behaviours were frequently positive. After four months of tri-weekly one-hour sessions, DBEP participants reported using less medication and having less intense attacks than the exercise-only and control subjects. However, as noted in the results, these treatment effects disappeared by the end of the follow-up period. The significance of these findings was further corroborated by both biomedical and behavioural changes occurring during the treatment period. Treatment effects for the DBEP subjects were indicated for Vital Capacity, Maximal Heart Rate, and Lactic and Pyruvic Acid levels. At pre-test, DBEP participants reported being generally less physically active and more socially active than both the exercise-only and control subjects. By the end of treatment, DBEP participants reported similar levels of physical and social activity as both the exercise-only and control subjects.

It will be recalled that a series of power analyses were reported in the introduction to the Results chapter. The measures of asthmatic behaviour generally gave a large population "effect" size ( $f$ ), and a correspondingly high power ( $f^2$ .80 to .97). The one exception, Total Attack Duration ( $f^2$  = .077), was found not to be

affected by treatment. Further discussion of this finding follows under the heading of Hypothesis I in this discussion. The measures of biomedical fitness generally gave a moderate population "effect" size ( $\delta$ ), with a correspondingly low power ( $\beta = .085$  to  $.56$ ). The one exception was Mean Maximal Heart Rate ( $\beta = .97$ ). These generally low power results for the biomedical measures, and especially for Mean Forced Expiratory Volume ( $\beta = .085$ ), indicated a high probability of Type II errors. Consequently, although the null hypothesis could not be rejected in these comparisons, further research with more powerful comparisons (i.e., increased sample size) must be performed in order to decrease the probability of Type II errors.

### Hypothesis I

It will be recalled that Hypothesis I predicted that the experimental subjects would report significant decreases in the amount of medication used, intensity of attacks, total duration of attacks, and asthma symptoms following treatment. The DBEP participants reported decreases in medication and attack intensity from pre-test to the end of treatment, while subjects in the exercise-only and control groups reported no significant changes in medication or attack intensity. The fact that these treatment effects were not maintained during the follow-up period may have resulted from two factors: 1) the subjects reported that they did not practice their DBEP skills outside the program, and 2) the follow-up period coincided with the allergy season (May-June). These findings support Hypothesis I with regard to medication use and intensity of attacks.

The DBEP failed to indicate a treatment effect on total duration of attacks. Theoretically, the DBEP was expected to enable the participants to decrease the severity of asthmatic attacks through the utilization of the program designed to alter their maladapted coping skills of breathing. Although Figure 2 appears to indicate a treatment-effect for the duration of attacks, the extremely high variance within groups appeared to negate any group differences. Power analysis was also low ( $\beta = .077$ ), indicating a high probability of Type II error. Given the treatment effects for medication use and

intensity of attacks, the lack of a decrease in duration of attacks can be interpreted as indicating that the DBEP is effective in reducing the intensity of asthma attacks, but may not be effective in reducing the incidence or duration of attacks.

Hypothesis I also predicted that the Asthma Symptom Checklist (ASC), measuring asthma symptomatology, would be positively affected by the treatment manipulation. The analysis did not reveal any group differences on the ASC as a result of treatment; therefore, the findings did not support Hypothesis I in regard to asthmatic symptoms. However, 9 out of the 10 asthma symptom clusters decreased from pre-test to follow-up for all groups. Therefore, one must conclude that the treatment program is not capable of producing changes in the symptomatological pattern of asthma attacks. In view of the particular design and use of the Asthma Symptom Checklist (ASC) in this study, there may be a number of plausible explanations as to why the ASC did not alter as a result of treatment. First, the ASC required each respondent to report on the frequency of occurrence (or non-occurrence) of 50 specific symptoms during asthmatic attacks. The data obtained determined the frequency of each symptom but did not indicate the severity. Thus it is possible that the treatment program may have altered the degree or severity of symptoms without affecting the type or pattern of symptoms experienced during an attack. This is consistent with the fact that other dependent measures (i.e., Medication, Attack Intensity, Vital Capacity, Maximal

Heart Rate, and Physical Activity level), which may be related to changes in the severity of asthma symptoms, did change significantly as a result of treatment. The ASC was utilized in this study to assess changes in the frequency of specific symptom clusters. As mentioned previously, the pattern of symptoms during an attack did not change as a result of treatment. The conclusion that the DBEP does not change the duration or symptomatological pattern of asthmatic attacks simply indicates that the treatment program may not be effective in terminating or changing the type of symptoms experienced during an attack. These findings do not overshadow the important finding that the DBEP did have ameliorative effects on some aspects of the asthmatic condition. The ASC could only have indicated a treatment effect if the treatment program had been designed to decrease or eliminate specific symptoms during an attack.

### Hypothesis II

It will be recalled that Hypothesis II predicted that the experimental subjects would demonstrate significant improvement in various aspects of their fitness, as indicated by the biomedical measures. The pre-test differences between the treatment group (Tb) and the combined group (Te and C) on Vital Capacity, Maximal Heart Rate, and Lactic Acid, all indicated that Group Tb was significantly less fit than groups Te and C. These pre-test differences were a result of differential attrition, with Group Te contributing the most to these differences. Further discussion of this finding can be found in the Post-Hoc Issues section. The findings of improved cardiopulmonary efficiency (Vital Capacity, Maximal Heart Rate) and exercise tolerance (Lactic and Pyruvic Acid levels) of the treatment subjects, compared to the exercise-only and control subjects, may offer support to Hypothesis II. It could be argued that the above findings represent regressions to the mean for the treatment group (Tb, and combined groups (Te and C), in view of their pre-test differences. Future investigation with these biomedical measures could clarify this issue, as it is possible that the interaction effect found in this study could have been caused by other non-treatment factors. However, the fact that significant improvements in fitness were indicated on cardiopulmonary and blood assay measures in the treatment subjects, implies that the independent variable (DBEP)

may have directly affected these functions. The fact that the exercise-only subjects did not show similar improvements (and in fact showed a deterioration on these measures), although their treatment program was identical (excluding the diaphragmatic breathing), further substantiates this explanation.

The following factors may have contributed to the lack of significant findings for the other blood assay measures (PH, base excess, hematocrit, and hemoglobin):

1. The particular measure was not significantly affected by the DBEP and/or the five-minute bicycle drill;
2. The instruments used in the study were not sufficiently sensitive or reliable to indicate significant differences; or
3. The statistical tests lacked sufficient power to detect differences (i.e.,  $\beta = .20$  to  $.44$ ).

It should be noted that although no significant treatment effect was found for Mean Forced Expiratory Volume, the combination of poor power ( $\beta = .085$ ), a close to significant F-test ratio ( $F(1,23) = 3.46$ ,  $p = .075$ ), and Figure 6 indicated that further investigation of this factor is justified.

### Hypothesis III

It will be recalled that Hypothesis III predicted that treatment subjects would significantly increase their recreational and/or social activity level in relation to the exercise-only and control subjects. At pre-test, all groups presented themselves as being quite sedentary relative to the general population, and that both physical and social activities were restricted to a few endeavours. The pre-test differences between the treatment group (Tb) and both the exercise group (Te) and control group (C) on physical and social activity levels indicated that Group Tb was significantly less active physically and more active socially than the other groups. As was the case with the pre-test biomedical measures, these pre-test differences were likely a result of differential attrition, especially Group Te. The "remaining" Group Te subjects were, in fact, more active (and more fit) than Group Tb at pre-test. Further discussion of this finding can be found in the Post-Hoc Issue section.

The increase in reported physical and/or social activities in the treatment subjects tended to be in frequency and/or duration of the same activities, not in the addition of new activities. This suggested that although Hypothesis III was generally supported, the treatment did not cause major lifestyle changes. For example, the DBEP subjects tended to employ their new skills to participate further in the activities they had already incorporated into their

lifestyle. One possible explanation for the treatment group's reluctance to expand into new activities with their DBEP skills may have been their lack of confidence in the mastery of the techniques involved after only four months of training. DBEP requires the acquisition of a precise skill and a high level of specialized muscular conditioning. Since the DBEP participants received feedback on their skill acquisition during the training sessions only, it is possible that they did not practice nor adhere to the treatment program, as they had not practiced nor observed others performing the DBEP in other stressful situations (i.e., Bandura, 1969; Meichenbaum, 1977). Consequently, the subjects may have tended to employ their DBEP skills in familiar activities only. Support for this explanation is found in the fact that once training in the DBEP had terminated, the treatment effects for physical and social activities began to diminish and return to pre-test levels. If mastery of the DBEP had taken place through an extended treatment phase, and/or a continuous follow-up with "booster sessions," one would anticipate that the subjects would have attempted new activities; it is conceivable they may not have returned to pre-test levels. Some unusual relationships between general levels of activity (physical and social) and some asthma-related measures were found. For example, in Figure 15, the exercise-only group appeared to be significantly more active socially than the treatment and control groups at post-treatment. In view of the large variance in social activity levels of the exercise-only

subjects at post-treatment, it appears that they may have attempted to employ their skills (which lacked the respiration training) in primarily social activities, although the group was highly heterogeneous in their level of participation. This result for the exercise-only group may be understood in the context of speculating that a "balanced exchange" between physical and social activities exists. For example, given that an individual has "x" hours per day available for physical and/or social activities, it is reasonable to assume that asthmatics would participate in activities they enjoy and/or believe they can perform. In view of the difficulties that the exercise-only subjects experienced with the program, it is not surprising that they reported lower physical activity and a more erratic social activity level than the DBEP participants at post-treatment. Further support for this "balanced exchange" explanation is found in the fact that DBEP participants increased proficiency in controlling attacks (less medication and intensity of attacks) which was matched by an increased participation in physical activity.

#### Hypothesis IV

Hypothesis IV predicted that the experimental subjects would attain a higher level of self-esteem, compared with the exercise-only and control groups. This hypothesis was not supported by the findings in this study. All groups tended to report increases in self-esteem throughout the investigation. The surprise finding was that of the control group's increase in self-esteem throughout the investigation. Regression toward the mean could account for the uniform increases in self-esteem. Alternatively, the increase across conditions for self-esteem may simply be an effect of repeated testing on a measure that is possibly subject to social desirability effects. It is also possible that the continuous self-monitoring by all subjects of their asthma and related behaviour throughout the investigation (including the control group) may have resulted in behavioural choices and efforts toward coping, as they were all being exposed to new data (through self-monitoring), and may have experienced a new sense of control over some aspects of their asthma. The amount of effort involved and degree of success in coping with their asthma (as defined by each subject) may have resulted in all groups reporting increases in self-esteem (i.e., Bandura, 1977). The explanation that intensive self-monitoring may have influenced self-esteem positively is supported by the fact that although the trend was toward increased self-esteem throughout the investigation,

all groups reported a significant increase in self-esteem only by the end of the follow-up. Further, the treatment group reported a return to baseline on all treatment effects during the follow-up period, while all groups continued to report a trend toward increased self-esteem during the follow-up period. It was hypothesized that the positive effects of this treatment program would be experienced by the experimental subjects as new behavioural capacities, thereby increasing their self-efficacy. However, the hypothesized positive "spill-over" from experiences in this treatment to the general measure of self-esteem employed, may not have occurred. Therefore, it is recommended that a direct measure of perceived self-efficacy be employed in future investigations in this domain.

### Post-Hoc Issues

#### (A) Effects of Exercise-Only Program

In view of the fact that the exercise-only subjects participated in a rigorous exercise program consisting of tri-weekly one-hour sessions for four months, it was anticipated that some treatment effects related to fitness level would occur. However, given that the exercise-only (Te) participants did not receive diaphragmatic breathing training in conjunction with their exercises, it was also anticipated that the specific treatment effects would differ from those found in the DBEP group.

In contrast to the exercise-only group (Te), the treatment group reported treatment effects for medication level and attack intensity. These findings led to the conclusions that the exercise program received by the Te subjects had no direct effect on their asthmatic condition, and that the additional component in the treatment group (diaphragmatic breathing) enabled these subjects to better control some aspects of their asthma (Medication Level and Attack Intensity). Since the exercise-only subjects did not receive training in a coping skill for their attacks (diaphragmatic breathing), the absence of treatment effects on these measures points to the essential ingredient underlying the DBEP.

The analysis of the biomedical data at pre-test found that the Te subjects were more fit than Tb subjects in some measures (Vital

Capacity, Maximal Heart Rate, and Lactic Acid Level)). These findings were not surprising since only the data on the subjects who completed the program were included; it appeared that the majority of subjects in the Te group who dropped out did so because they were the least fit at pre-test and found the program too difficult. This explanation is supported by the fact that Group Te had by far the highest attrition rate (8 of 20) and that the subjects who remained in the program were more fit (VC, MHR, and LA) and more physically active than the treatment subjects at pre-test. Interestingly, by the end of the treatment program there were no differences between the treatment and exercise-only subjects on VC, MHR, LA, physical or social activity. The program received by Te subjects did not improve cardiopulmonary efficiency (as was the case for Group Tb), but in fact tended to increase MHR and decrease VC from pre-test to the end of treatment. A possible explanation for this unusual result is that the Te subjects managed to increase their MHR and decrease their VC by post-treatment as a result of increased effort and poor breathing patterns during the bicycle drill. Their perceived increase in exercise tolerance (which they reported in the program evaluation) may have led them to "try harder" during the bicycle drill; in combination with a poor respiratory exchange, this could have elevated their MHR. The Te group's exercise tolerance was in fact lower than the Tb group's, as was indicated by their respective post-treatment Pyruvic Acid levels.

These findings point again to the conclusions that the exercise program received by the Te subjects did not have any direct effect on their asthmatic condition, nor their fitness level, and that the Tb group received an important component in their training (DBEP), one which enabled them to alter critical parameters related to their asthmatic condition (VC, MHR, LA, PA, and Physical Activity Level).

In conclusion, it appears that whatever skills were acquired by the Te subjects, these skills did not affect their asthma directly, nor did they appear to affect other related behaviours.

#### (B) Follow-up Results

It is important to note that all the treatment effects that were reported with regard to Hypotheses I and III returned to baseline levels by the end of follow-up. These included medication, average attack intensity, and physical activity level. These findings suggest that a complete mastery of the DBEP did not occur during the treatment phase, and when treatment was terminated the subjects under treatment quickly returned to previous means of coping with their asthma. Given the abundance of literature indicating the difficulties related to the compliance and adherence to treatment, especially in new situations (i.e., Meichenbaum, 1977; Bandura, 1977; Ellis, 1987), it was not entirely unexpected that once adherence to the DBEP was not being monitored (during follow-up), that some return to previous means of coping would occur. Another factor which may have contributed to these dramatic returns to baseline may be that follow-up

measures were reported during the spring allergy season (May-June). The exacerbating effect of allergies on the asthmatic condition could conceivably have contributed to the increases in attack intensity and medication level, with a corresponding decrease in the physical activity level during the follow-up period.

Biomedical measures of fitness related to Hypothesis II were collected at pre-test and post-treatment only. Consequently, although a number of significant improvements in various aspects of fitness were demonstrated for the treatment subjects, biomedical follow-up measures were not obtained.

#### (C) Program Attendance, Expectations, and Evaluation

As mentioned previously, no significant differences in attendance between the three groups (two groups of DBEP and one group of exercise-only) involved in the treatment program were found. Consequently, the treatment effects found cannot be attributed to differential attendance to the program. No significant differences between the DBEP and exercise-only conditions were found on the five questions related to program expectations. Consequently, the treatment effects found for the DBEP participants cannot be attributed to pre-program expectations. It will be recalled that a further analysis comparing all three treatment groups on program expectations was performed to explore the potential impact of different instructors. The finding that the DBEP participants who had had an asthmatic instructor held generally higher expectations for the program than the

DBEP participants who had a non-asthmatic instructor strongly suggests that the instructor can be a powerful role-model. The facts that the two DBEP groups received identical programs, and that the exercise-only group (with a diabetic instructor) had higher expectations than the DBEP group with a non-asthmatic, support the interpretation that a more easily identifiable role-model (i.e., with a chronic condition) tends to influence the participants' expectations for the program.

It will be recalled that the same five questions used in the Program Expectations were presented to the three intervention groups at the end of treatment to evaluate the program's success in helping them deal with their asthma. Interestingly, the exercise-only group reported a significantly higher exercise tolerance evaluation than the DBEP participants. Their perceived increase in exercise tolerance was likely a result of the intense efforts during the program. This interpretation is based on the informal observation of this group, as participants frequently had to stop performing the exercises during class. Conversely, the DBEP participants (who performed the same exercise program as the exercise-only group, but with the diaphragmatic breathing) seldom had to stop during the sessions.

## CHAPTER V

## SUMMARY, IMPLICATIONS, CONSIDERATIONS, AND RECOMMENDATIONS

Summary of Findings

The findings related to the study's hypotheses were as follows:

- i. Treatment effects were found for medication use and attack intensity, while no treatment effects were found for total attack duration or asthma symptoms.
- ii. Treatment effects were indicated for the biomedical measures of VC, MHR, LA, and PA.
- iii. Treatment effects were found for physical activity, but not social activity.
- iv. No treatment effects were observed for self-esteem.

Clinical and Theoretical Implications

This study contributed to the understanding, management, and treatment of a number of asthma-related behaviours. There are a number of implications of these findings.

Clinical implications

In view of the intensive and long-term training required to master the diaphragmatic breathing exercise program (DBEP), perhaps only individuals who are motivated and determined to follow this rigorous exercise program in a consistent manner are likely to

achieve the fitness and skills required to yield effective coping skills for attacks. However, the benefits related to fitness (VC, MHR, LA, PA), asthma-related behaviour (medication use, attack intensity), and lifestyle options (physical and social activity), certainly justify the DBEP as a viable option for asthmatics who can complete the program. In view of the short-term and long-term side effects of the many medications employed by asthmatics, as well as the limited effectiveness of most other psychological treatment approaches in producing clinically significant changes in the asthmatic's behaviour, the DBEP does have some merit and deserves further investigation with respect to maximizing its positive effects.

#### Theoretical Implications

The one treatment effect (decreased attack intensity) in relation to the general lack of other direct treatment effects found for the asthma syndrome, implies that DBEP had a minimal effect on changing the nature of the asthmatic's symptomatological picture. However, given the treatment effects on asthma-related behaviours and fitness, it may be futile to expect changes in the actual configuration of the asthmatic syndrome. Since the asthma syndrome in each individual is the symptomatic manifestation of their specific underlying physiological anomalies, the asthma symptoms may not be accessible for alterations in configuration through the DBEP. Future research on treatment may be more productive by developing coping skills to control or decrease the intensity or degree of the asthmatic-

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ic response under the causal conditions, rather than developing skills to avoid the causes of attacks. Since this study, as well as others, have successfully altered some asthma-related behaviours, it is possible that further research in these areas may lead to more effective methods of decreasing the overall asthmatic response by developing coping skills which encourage participation in "normal" lifestyle activities and inhibit the manifestation of some of the asthma-related responses.

#### Methodological Considerations

Since this study is the first to employ a multi-dependent research approach to investigate psychological and physiological changes in asthmatics arising out of this treatment program, many of the procedures, instruments, and questions posed, were exploratory in nature.

Most of the self-report behavioural measures were taken at four-month intervals. In hindsight, the self-report measures could have been more accurate and/or sensitive if they had been included in the daily diary of medication usage, attack intensity, and total attack duration. These self-report measures were not included initially in the diary due to concerns regarding compliance to recording all these measures daily. However, given the excellent compliance for the "medication diary," a well-designed "asthma-related behaviour diary"

would have been preferable to requesting the subjects to report four months of specific behaviour.

There were difficulties with some measures. One shortcoming of this study was that the biomedical measures were not taken at follow-up. It would have been important to know if the biomedical treatment effects had persisted at follow-up. A follow-up was not possible for logistical reasons. In retrospect, some biomedical measures were either redundant or unnecessary but this was primarily a result of the exploratory nature of the investigation. Future research should include only important and precise biomedical measures, as the entire protocol can be difficult for both the subjects and researchers. For example, the collection of blood from the antecubital vein, both prior to and immediately following the bicycle drill, proved to be technically difficult, if not impossible to accomplish on some subjects; consequently it was quite an uncomfortable procedure to administer and/or experience. The use of forced expiratory volume in one second (FEV-1), as previous literature stated, was found to be effort-dependent. This fact was confirmed by the majority of subjects who improved their FEV-1 on each of three attempts, on both occasions. The use of total respiratory resistance (TRR), as determined by forced oscillation technique, would have been preferable, as it is not effort-dependent. Unfortunately, TRR was not available for this study. As was explained in the discussion, the asthma symptom

checklist measures had faults which resulted in the loss of potentially useful information.

In view of the relatively low power on some measures, i.e., Total Attack Duration ( $\beta = .077$ ), Mean Forced Expiratory Volume ( $\beta = .085$ ), and the resultant high probability of Type II errors, further investigation of these factors, using more powerful comparisons (i.e., increased sample size), are justified."

Finally, in view of the dramatic attrition rate in the exercise-only training group (a loss of 8 out of 20 subjects), a "probational period" and/or contract may have reduced this result. Unfortunately, data on the subjects who dropped out was not available as they failed to continue reporting their behaviour.

#### Recommendations for Further Research

1. Future research should compensate for the methodological flaws of this study. Points considered in the Methodology include:
  - a) more reports on the behavioural measures (i.e., daily),
  - b) the measurement of the biomedical variables at follow-up,
  - c) the utilization of more precise cardiopulmonary measures,
  - d) a larger sample, to increase the power of some measures.
2. Instructors of the DBEP should be former graduates of the program, as this study suggested that their experience and role-modelling can be an important mediator in behavioural compliance.
3. Smaller (i.e.,  $N = 10$ ) groups of DBEP subjects should increase the effectiveness of imparting the skills of the program.

4. It would be interesting to repeat a similar study on child asthmatics, as the DBEP is conducive to teaching children the required skills. These skills are derived from a series of precise physical exercises that children should have little difficulty learning.

5. The treatment effects of this program returned to pre-test levels during follow-up. Further investigation of the DBEP should consist of a more intensive treatment period (i.e., 5 x 1 hour per week for 4 - 6 months) followed by a series of "booster" sessions (i.e., 2 x 1 hour per week for 4 - 6 months). The dynamics underlying this return to baseline should be further investigated.

6. Finally, future research in this area would benefit substantially from paying closer attention to assessing the reliability, internal consistency, and validity of the measures employed (e.g., via pilot work, as well as after data have been collected).

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## APPENDIX A

SCREENING QUESTIONNAIRE



December 4, 1981

Dear Potential Participant:

Thank you for your recent phone call regarding our Asthma Project. I am sure you have a lot of questions to ask about the experimental treatment, and let me assure you that these will be answered before we ask anyone to volunteer for the Project. First, however, we would like to determine if you are eligible for the research and asthma treatment and the enclosed questionnaire is designed to determine just that.

While the Project team is made up of several clinicians and researchers in Psychology, Kinanthropology, Medicine, and Nursing, I would like to assure you that only Ken Ekstrand and I will have access to any information you give on this and subsequent questionnaires we will ask you to complete, and that all information will be handled in a most confidential manner. We ask you to complete this appended questionnaire as accurately and completely as possible and to return it in the addressed envelope within 24 hours of receiving this letter. Ken will phone you in December to let you know about your participation.

While we ask you to express a definite opinion concerning your availability and willingness to take part in the research and its measurements, this does not in any way commit you to participate. As stated previously, we will describe the entire procedure and tests before we ask you to volunteer and only after that will we seek your consent.

We thank you in advance and look forward to your response.

Sincerely yours,

Ken Ekstrand  
Ph.D. Student

Michel Girodo, Ph.D.  
Professor of Psychology  
Project Director

encl.

Personal Data Section

Name: \_\_\_\_\_ Telephone: (Residence) \_\_\_\_\_  
(Please Print) (Business) \_\_\_\_\_

Addressee: \_\_\_\_\_ Postal Code: \_\_\_\_\_  
(Print) \_\_\_\_\_

Age (as of January 1st, 1982): \_\_\_\_\_

Birth Date: \_\_\_\_\_  
Month / Day / Year

Sex: Male ☐

Female ☐

If you qualify for participation in the 16 week therapy program beginning in January, would you be available to:

(Check those which are true)

- ☐ Attend three one-hour sessions per week on Monday, Wednesday, and Friday evenings.
- ☐ Attend the classes beginning at 5:30 p.m.
- ☐ Attend the classes beginning at 6:30 p.m.
- ☐ Attend the classes beginning at 8:00 p.m.
- ☐ Attend a pretesting, post-testing, and follow-up phase in January, May, and August, respectively. (Each session will take 2-3 hours, on a Saturday)
- ☐ Agree to fill out a number of questionnaire during the pre, post and follow-up testing phases. The questionnaires are related to your patterns of behaviour and attitudes towards your asthmatic condition.
- ☐ If selected, agree to participate in a number of physical, respiratory, cardiovascular and blood measures. (Total time of approximately 20 minutes; once at all three testing phases).
- ☐ Record the attacks you have, and medications you utilize, in a diary we supply you, for the duration of the project (until August).

If you qualify for participation in the program, but are placed on the waiting list; would you be available to:

(Check those which are true)

- ☐ Attend a pretesting, post-testing, and follow-up phase in January, May, and August, respectively. (Each session will take 2-3 hours).
- ☐ Agree to fill out a number of questionnaires during the pre, post and follow-up testing phases. The questionnaires are related to your patterns of behaviour and attitudes towards your asthmatic condition.
- ☐ If selected, agree to participate in a number of physical, respiratory, cardiovascular and blood measures. (Total time of approximately 20 minutes; once at all three testing phases).
- ☐ Record the attacks you have, and medications you utilize, in a diary we supply you, for the duration of the project (until August).
- ☐ Participate in the therapy program after the initial research program has been completed (August).

If you do not qualify for participation in the 16 week therapy program beginning in January, and you are not placed on the waiting list, would you:

- |                          |                          |                                                                                                                                                                                           |
|--------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Yes                      | No                       | Be interested in participating in the respiratory and physical retraining program independent of the research project. (This program would commence sometime after the research project). |
| <input type="checkbox"/> | <input type="checkbox"/> |                                                                                                                                                                                           |

I attest to the accuracy of my responses to the above questions.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

### History Questionnaire

In order for this research to be successful, it is necessary that you fill-out this questionnaire as accurately and truthfully as possible. All the information gathered will be strictly confidential. Your cooperation in this effort is very important and will be greatly appreciated.

1. Please indicate (or give the best estimate possible) the date when you were first diagnosed as having asthma.

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
(Month) / (Date) / (Year)

2. Indicate the name and phone number of the main doctor who is presently monitoring your asthmatic condition.

\_\_\_\_\_/\_\_\_\_\_  
(Name) / (Phone number)

3. A) Circle the appropriate point below for each of the following factors as to how they affect your asthmatic condition

1) Physical exercise (i.e. stairs, running, etc.)      never . . . . . always

2) Allergies (i.e. foods, pollens, etc.)      never . . . . . always

3) Weather conditions (cold, damp, etc.)      never . . . . . always

4) Infections (Specify \_\_\_\_\_)      never . . . . . always

5) Other reason (Specify \_\_\_\_\_)      never . . . . . always

4. If you checked allergies in the above question, please specify the main allergies responsible for inducing your asthmatic attacks, and when this allergies affect your condition.

| Allergy (Please Print) | Frequency (Check appropriate boxes)                                                      |
|------------------------|------------------------------------------------------------------------------------------|
| 1.                     | <input type="checkbox"/> Year Round <input type="checkbox"/> Seasonal (_____)<br>Specify |
| 2.                     | <input type="checkbox"/> Year Round <input type="checkbox"/> Seasonal (_____)<br>Specify |
| 3.                     | <input type="checkbox"/> Year Round <input type="checkbox"/> Seasonal (_____)<br>Specify |
| 4.                     | <input type="checkbox"/> Year Round <input type="checkbox"/> Seasonal (_____)<br>Specify |
| 5.                     | <input type="checkbox"/> Year Round <input type="checkbox"/> Seasonal (_____)<br>Specify |
| 6.                     | <input type="checkbox"/> Year Round <input type="checkbox"/> Seasonal (_____)<br>Specify |

5. Have you ever been hospitalized for your asthma?

(Check one)

☐ No

☐ Yes

A) How many times?

\_\_\_\_\_ (Estimate)

B) What was your longest hospitalization, and when?

Number of days / \_\_\_\_\_ Dates

6. When you have an attack, how long does it last? (Fill in each of the following):

A) \_\_\_\_\_   
 (Shortest attack)

B) \_\_\_\_\_   
 ("Average" attack)

C) \_\_\_\_\_   
 (Longest attack)

7. How many asthmatic attacks did you have in this past year? (Check the appropriate box)

- ☐ 10 or less
- ☐ 11 to 25
- ☐ 26 to 50
- ☐ 51 to 100
- ☐ 100 or more

8. Of all the attacks you had in this past year, what percentage of these attacks were sufficiently severe to require your absence from regular activities (i.e. work, school, recreational and social activities).

(Check one)

- ☐ less than 10%
- ☐ 11 to 25%
- ☐ 26 to 50%
- ☐ 51 to 75%
- ☐ more than 75%

9. List below the medications and dosages that you have taken for your asthma in the last 2 years.

|    | <u>Medication</u> | <u>Daily Dosage</u> | <u>Taken only when required</u> |                             |
|----|-------------------|---------------------|---------------------------------|-----------------------------|
| 1. |                   |                     | <input type="checkbox"/> Yes    | <input type="checkbox"/> No |
| 2. |                   |                     | <input type="checkbox"/> Yes    | <input type="checkbox"/> No |
| 3. |                   |                     | <input type="checkbox"/> Yes    | <input type="checkbox"/> No |
| 4. |                   |                     | <input type="checkbox"/> Yes    | <input type="checkbox"/> No |
| 5. |                   |                     | <input type="checkbox"/> Yes    | <input type="checkbox"/> No |
| 6. |                   |                     | <input type="checkbox"/> Yes    | <input type="checkbox"/> No |

10. List any other medical condition that you have that might be influenced by your participation in physical retraining program (i.e. chest diseases, emphysema, heart conditions, diabetes, high blood pressure, etc.)

| Condition | Since (Give date of diagnosis) |
|-----------|--------------------------------|
| 1.        |                                |
| 2.        |                                |
| 3.        |                                |
| 4.        |                                |
| 5.        |                                |

## APPENDIX B

POST-SCREENING CORRESPONDENCE

PRE-PROGRAM ASSIGNMENT

AND INFORMED CONSENT

UNIVERSITÉ D'OTTAWA



UNIVERSITY OF OTTAWA

December 21, 1981

Dear Applicant:

Thank you for your prompt return of the questionnaire we mailed to you on December 4, 1981. As you will recall, the purpose of that questionnaire was to determine if you were eligible for the research project.

The Project Selection Committee reviewed all the information and based on a complex set of selection criteria, determined which files were eligible for participation. The factors which were considered were: 1) Availability to participate; 2) Willingness to participate in all phases; 3) Length and factors involved in each asthmatic condition; 4) Severity of each asthmatic condition; 5) Medications employed; 6) Other medical conditions that might influence our research findings; 7) Age and sex of the applicant.

I regret to inform you that your application to participate in this research project was turned down by our Project Selection Committee for one of, or a combination of, the above factors. However, as I explained to you over the phone, although you have not been selected for the research project, you may still participate in this same asthma treatment program, after this research phase is completed.

Your name and address have been forwarded to the persons involved in running this treatment program, and they have assured us that they will contact you by letter prior to starting the next session.

Thank you for your interest and cooperation in this research project, and have a happy New Year!

Sincerely,

Ken Ekstrand  
Ph.D. Student

Michel Girodo, Ph.D.  
Professor of Psychology  
Project Director

December 21, 1981

Dear Applicant:

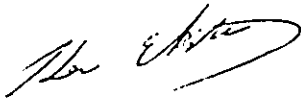
Thank you for your prompt return of the questionnaire we mailed to you on December 4, 1981. As you will recall, the purpose of that questionnaire was to determine if you were eligible for the research project.

The Project Selection Committee reviewed all the information, and based on a complex set of selection criteria, determined which files were eligible for participation. The factors which were considered were 1) Availability to participate; 2) Willingness to participate in all phases; 3) Length and factors involved in each asthmatic condition; 4) Severity of each asthmatic condition; 5) Medications employed; 6) Other medical conditions that might influence our research findings; 7) Age and sex of the applicant.

I am pleased to inform you that your application to participate has been considered eligible by our Project Selection Committee! Please find enclosed: 1) An informed consent form; 2) A Pre-program assignment; 3) A map and parking information. If you wish to participate in this treatment program, it is imperative that you read carefully and follow the instructions enclosed. Ken Ekstrand will telephone you in early January and inform you as to where and when the program will begin.

Thank you for your interest and cooperation in this research project, and have a happy New Year!

Sincerely,



Ken Ekstrand  
Ph.D. Student



Michel Girodo, Ph.D.  
Professor of Psychology  
Project Director

Introduction to Pre-Program Assignment

Now that you have been selected for the research project, this phase of the program requires that you complete the following "Daily Medication and Crisis Summary" beginning December 28th, 1981, until the beginning of the research project (January 18th, 1982).

The purpose of this component of the research is to determine what medications, dosages, and administration procedures are commonly used by asthmatics to control their condition. In addition, we are interested in the patterns of medication application, and patterns of asthmatic crises of the individuals who participate in this project.

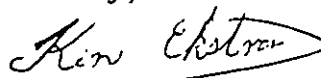
On the following pages you will find a "Daily Medication and Crisis Summary". We are asking you to record, on a daily basis any and all medications you take, as well as how much on each occasion. In addition, we ask that you record both the duration (in minutes) and intensity (on an 11 point scale) of any asthmatic crises that you experience.

This particular component of the project is extremely important, and by cooperating in this request, you will be helping us to make this a more well rounded program for both yourself and other asthmatics to benefit from in the future.

Once again, please begin assignment on December 28th, 1981 and continue recording until January 18, 1982; further instructions will follow in January.

Thank you in advance for your cooperation,

Sincerely,



Ken Ekstrand,  
Ph.D. Student.

# Daily Medication and Crisis Summary

160

Name: \_\_\_\_\_

Week of: from \_\_\_\_\_ to \_\_\_\_\_

| DAY              | Medication        |                        | Time & Circumstances | Crisis    |             |
|------------------|-------------------|------------------------|----------------------|-----------|-------------|
|                  | When taken (time) | Type, Dosage, Comments |                      | Duration* | Intensity** |
| <u>Monday</u>    |                   |                        |                      |           |             |
| <u>Tuesday</u>   |                   |                        |                      |           |             |
| <u>Wednesday</u> |                   |                        |                      |           |             |
| <u>Thursday</u>  |                   |                        |                      |           |             |
| <u>Friday</u>    |                   |                        |                      |           |             |
| <u>Saturday</u>  |                   |                        |                      |           |             |
| <u>Sunday</u>    |                   |                        |                      |           |             |

Week of: from \_\_\_\_\_ to \_\_\_\_\_

| DAY              | Medication        |                        | Time & Circumstances | Crisis    |             |
|------------------|-------------------|------------------------|----------------------|-----------|-------------|
|                  | When taken (time) | Type, Dosage, Comments |                      | Duration* | Intensity** |
| <u>Monday</u>    |                   |                        |                      |           |             |
| <u>Tuesday</u>   |                   |                        |                      |           |             |
| <u>Wednesday</u> |                   |                        |                      |           |             |
| <u>Thursday</u>  |                   |                        |                      |           |             |
| <u>Friday</u>    |                   |                        |                      |           |             |
| <u>Saturday</u>  |                   |                        |                      |           |             |
| <u>Sunday</u>    |                   |                        |                      |           |             |

\* Duration: record approximate number of minutes (i.e. 15 minutes)

\*\* Intensity: record appropriate number: very mild 1 2 3 4 5 6 7 8 /9 10 11 very severe

## Parking Information

161

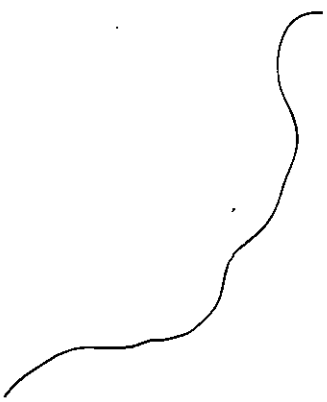
7 On Weekends: You may park your vehicle in any University of Ottawa parking lot. For your convenience, we suggest lot "X", as marked on the map. (Remember: free parking only on weekends, i.e. during the testing phases).

On Weekdays: You may

- 1) Park your vehicle on one of the nearby streets. (We do not recommend this option -- parking is scarce around the University during the winter evenings).
- 2) \* Purchase an evening pass which entitles you to park your vehicle in most University of Ottawa parking lots. (We recommend this option -- parking is only \$10.00 for January to April).
3. \* Purchase a one-night parking pass for 75 cents. (The parking office is open for this service).

\* In order to purchase one of the evening parking passes, you must visit the University of Ottawa Parking Office at 631 King Edward Ave, between 8 a.m. - 12 noon, or 1 p.m. - 5 p.m., on weekdays.

For further information regarding parking, call 231-3954.

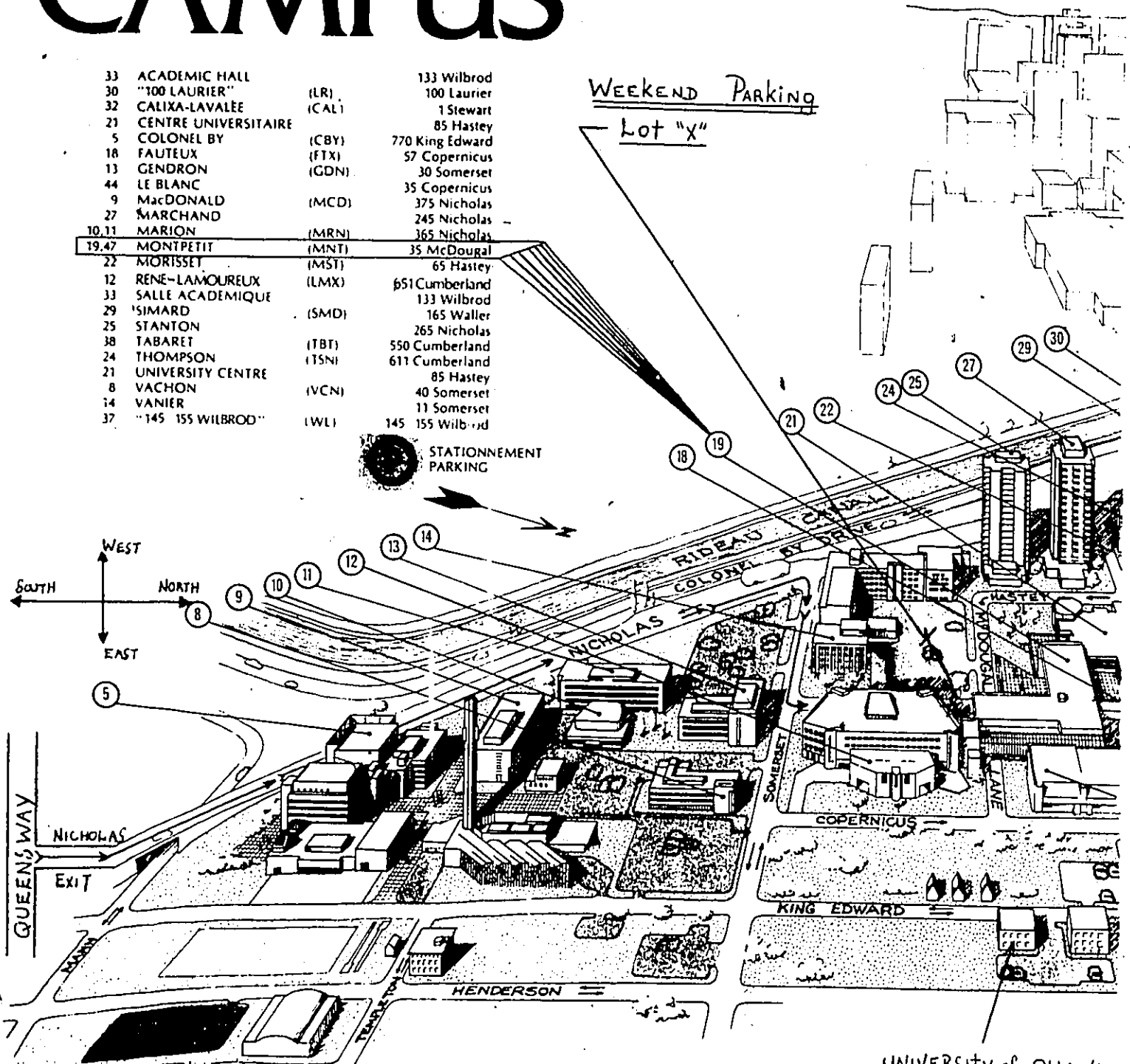
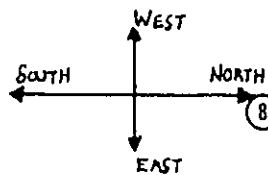


# CAMPUS

|        |                      |       |                 |
|--------|----------------------|-------|-----------------|
| 33     | ACADEMIC HALL        |       | 133 Wilbrod     |
| 30     | "100 LAURIER"        | (LR)  | 100 Laurier     |
| 32     | CALIXA-LAVALÉE       | (CAL) | 1 Stewart       |
| 21     | CENTRE UNIVERSITAIRE |       | 85 Hastey       |
| 5      | COLONEL BY           | (CBY) | 770 King Edward |
| 18     | FAUTEUX              | (FTX) | 57 Copernicus   |
| 13     | GENDRON              | (GDN) | 30 Somerset     |
| 44     | LE BLANC             |       | 35 Copernicus   |
| 9      | MacDONALD            | (MCD) | 375 Nicholas    |
| 27     | MARCHAND             |       | 245 Nicholas    |
| 10, 11 | MARION               | (MRN) | 365 Nicholas    |
| 19, 47 | MONTPETIT            | (MNT) | 35 McDougal     |
| 22     | MORISSET             | (MST) | 65 Hastey       |
| 12     | RENÉ-LAMOUREUX       | (LMX) | 651 Cumberland  |
| 33     | SALLE ACADEMIQUE     |       | 133 Wilbrod     |
| 29     | SIMARD               | (SMD) | 165 Waller      |
| 25     | STANTON              |       | 265 Nicholas    |
| 38     | TABARET              | (TBT) | 550 Cumberland  |
| 24     | THOMPSON             | (TSN) | 611 Cumberland  |
| 21     | UNIVERSITY CENTRE    |       | 85 Hastey       |
| 8      | VACHON               | (VCN) | 40 Somerset     |
| 14     | VANIER               |       | 11 Somerset     |
| 37     | "145 155 WILBROD"    | (WLI) | 145 155 Wilbrod |

WEEKEND PARKING  
Lot "X"

STATIONNEMENT  
PARKING



UNIVERSITY of OTTAWA  
Parking Office

## Asthma Project

### Informed Consent

The Ethics guidelines for human subjects participating in research projects promulgated by the Canadian and Ontario Psychological Associations, and the Social Sciences and Humanities Research Council indicate that you be informed of the following: that you have the right:

1. To know what you are participating in;
2. To know what you are to do or may be asked to do in the study;
3. To choose to participate -- that is to volunteer. You cannot be coerced into participating;
4. To know that your responses will be kept in the strictest confidence and will be used only for purposes of this research, without personal identification;
5. To cease your participation at any time;
6. To be provided reasonable protection from physical and emotional harm as a result of your participation during the course of the experimental treatment;
7. To know the results of your participation; to any debriefing that may be appropriate at the termination of the study.

### Description of Research Project

We are investigating the biochemical, physical, emotional, and social effects of a physical exercise and respiratory retraining program in persons suffering from asthmatic problems. Various people have taken part in this program before and, while on the basis of their reports we have reason to believe in its effectiveness, this project would represent the first attempt at scientifically and concretely documenting which people benefit, in which ways, and to what degree.

Without going into too many details, you would be correct in assuming that not all of you will be participating in exactly the same treatment -- and this for reasons of logistics and design. Nevertheless, we shall endeavour to see to it that everyone who participates has the opportunity to avail themselves of either the complete program, or at least to those components of the program which we will have determined to be necessary and sufficient for obtaining some benefit. Some of you will be asked to take part in the complete program by offering you all components at the same time, while others will have the components presented as individual units over time. Still

others will be asked to "carry-on" as usual and to check with us periodically, and following this delay, to begin participating in the essential elements of the treatment.

If you agree to take part in the project, all participants will be asked to undergo testing prior to and at various times following the termination of the treatment program. All participants will be asked to complete a variety of questionnaires designed to get us to know more about you. A certain number of you will also be asked to undergo physiological tests. These include:

1. Physical tests (height, weight, chest circumference, etc...);
2. Blowing into a mouthpiece forcefully;
3. Exercising on a stationary bicycle for 4 minutes or so;
4. Blood pressure measures (i.e. cuff), and heart rate measures (involving recordings from placed electrodes);
5. Blood samples. These will be taken twice; once before and once again after the bicycle exercise.

The treatment program also includes a physical exercise component during the 1 hr. sessions. The exercises are mild to moderate in intensity initially and require more effort as you progress through the program.

Given the information above on testing and the exercise in the program there is reason to believe that some of you may encounter some difficulty in your participation. Some of you may experience a degree of anxiety or nervousness in connection with the testing and this could prompt respiratory difficulties or an asthmatic crisis (i.e., an asthmatic attack). Also, some of you may experience these difficulties during the course of the treatment and exercise program. Other unspecified problems could be encountered depending on the severity of your asthma and other unique medical conditions associated with your asthma in particular. With respect to these potential stressors we would like to draw your attention to the following items:

1. While we will be asking you to engage in the testing and the exercises, we want you to feel free to (a) decide not to take part in a program element if you are concerned about its possible effects; (b) stop your participation at any time for whatever reason; and (c) participate at your own pace if you so desire.
2. Bring with you whatever medication or medicine aids you usually need to handle an asthmatic crisis or other difficulties.

3. Make sure that you consult with your doctor about your readiness for this program if you have any doubts about whether or not you should participate.

I acknowledge having read this informed consent form and am in agreement for the same.

By my signature below, I indicate that I am voluntarily participating in this research which will involve the procedures described above over a 16 week period. Further, I release the University of Ottawa and all members of its staff and any of its students who may be involved in this research from all claims arising out of any injury, whether physical or mental, which may arise as a consequence of this research in which I am to be a participant and I assume full responsibility for the same.

WITNESS: \_\_\_\_\_

YOUR NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

DATE \_\_\_\_\_

## APPENDIX C

INTRODUCTION TO PROGRAM ASSIGNMENT

AND

PRE-TEST QUESTIONNAIRE BOOKLET

Introduction to Program Assignment

As you will recall, in December we requested that you complete a "Daily Medication and Crisis Summary" that began December 28th. The purpose of that component was to obtain a "baseline" of your medications, as well as the nature of your asthmatic attacks. That assignment should be completed.

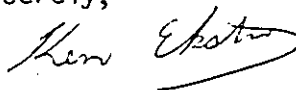
The purpose of this assignment is the same as the one mentioned above, but the beginning and completion of your medication and crises monitoring will now coincide with the beginning and termination of the research project.

The method of filling-out this "Daily Medication and Crisis Summary" is identical to the previous assignment. Once again, this component of the research is important, and your cooperation is required if this program is to be successful. We will be telling you later when and how to return these summaries.

The results of your participation will give us information concerning what components of the project were the most profitable for you and what parts might be re-organized. We can only determine this if you complete all phases of your participation in the project.

Thank you in advance for your cooperation,

Sincerely,



Ken Ekstrand,  
Ph.D. Student.

# Daily Medication and Crisis Summary

168

Name: \_\_\_\_\_

Week of: from \_\_\_\_\_ to \_\_\_\_\_

| DAY              | Medication        |                        | Crisis               |                       |
|------------------|-------------------|------------------------|----------------------|-----------------------|
|                  | When taken (time) | Type, Dosage, Comments | Time & Circumstances | Duration* Intensity** |
| <u>Monday</u>    |                   |                        |                      |                       |
| <u>Tuesday</u>   |                   |                        |                      |                       |
| <u>Wednesday</u> |                   |                        |                      |                       |
| <u>Thursday</u>  |                   |                        |                      |                       |
| <u>Friday</u>    |                   |                        |                      |                       |
| <u>Saturday</u>  |                   |                        |                      |                       |
| <u>Sunday</u>    |                   |                        |                      |                       |

Week of: from \_\_\_\_\_ to \_\_\_\_\_

| DAY              | Medication        |                        | Crisis               |                       |
|------------------|-------------------|------------------------|----------------------|-----------------------|
|                  | When taken (time) | Type, Dosage, Comments | Time & Circumstances | Duration* Intensity** |
| <u>Monday</u>    |                   |                        |                      |                       |
| <u>Tuesday</u>   |                   |                        |                      |                       |
| <u>Wednesday</u> |                   |                        |                      |                       |
| <u>Thursday</u>  |                   |                        |                      |                       |
| <u>Friday</u>    |                   |                        |                      |                       |
| <u>Saturday</u>  |                   |                        |                      |                       |
| <u>Sunday</u>    |                   |                        |                      |                       |

\* Duration: record approximate number of minutes (i.e. 15 minutes)

\*\* Intensity: record appropriate number: very mild 1 2 3 4 5 6 7 8 9 10 11 very severe

Questionnaire Booklet  
Research Project on Asthmatics  
University of Ottawa

### Introduction to Booklet

This section of the study is designed to assess some characteristics of asthmatic individuals. The following questionnaires deal with behaviours and attitudes of asthmatics towards fitness, recreation, and leisure activities.

All the information gathered will be strictly confidential. We are interested in what patterns of recreational and leisure activities you are involved in, and how you feel about yourself and certain aspects of your condition. In order for this study to be successful, it is necessary that everyone fill out the questionnaires as accurately and truthfully as possible. Your cooperation in this effort is very important and will be greatly appreciated.

You will find that each questionnaire has its own set of instructions. If any of the instructions are unclear, please do not hesitate to ask me to clarify them. The time required to complete these questionnaires will involve approximately one to two hours, however, you will be able to answer at your own pace. Do take as much additional time as you need.

Thank you in advance for your time and cooperation,

Sincerely,



Ken Ekstrand,  
Ph.D. Student.

# Physical Activity Questionnaire

Please fill out the following, and then procede to question #1. (Please print)

|            |         |     |     |            |
|------------|---------|-----|-----|------------|
| Given Name | Surname | Sex | Age | Date today |
|------------|---------|-----|-----|------------|

# 1

Please indicate with an "X" whether or not you have engaged in the following activity within the last four months.

# 2

How many times within the last four months did you engage in each activity marked "yes" in Question #1. (Give the most accurate estimate possible).

# 3

How much time did you usually spend doing this activity on the average on each occasion (Give the most accurate estimate possible).

Mark "yes" or "no" for each activity

Number of times in the last four months

Hours

Average Number of Minutes

no

yes

|  |  |  |
|--|--|--|
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| Activity                   | Mark "yes"<br>or "no" for<br>Each activity |                                 | Number of times<br>in the last<br>four months                  | Average Number<br>of<br>Hours Minutes                          |
|----------------------------|--------------------------------------------|---------------------------------|----------------------------------------------------------------|----------------------------------------------------------------|
| 1. Swimming                | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 2. Ice hockey              | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 3. Golf                    | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 4. Alpine Skiing           | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 5. Bowling                 | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 6. Tennis                  | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 7. Cross-country skiing    | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 8. Curling                 | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 19. Ice skating            | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 10. Baseball               | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 11. Walking (for exercise) | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 12. Bicycling              | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 13. Dancing                | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 14. Volleyball             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 15. Fishing                | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |

|                      | Mark "yes"<br>or "no" for<br>Each activity |                                 | Number of times<br>in the last<br><u>four months</u>           | Average Number<br>of<br>Hours Minutes                          |
|----------------------|--------------------------------------------|---------------------------------|----------------------------------------------------------------|----------------------------------------------------------------|
| 16. Badminton        | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 17. Hunting          | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 18. Snowmobiling     | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 19. Camping          | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 20. Football         | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 21. Basketball       | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 22. Horseback riding | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 23. Soccer           | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 24. Water skiing     | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 25. Hiking           | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 26. Snowshoeing      | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 27. Jogging, running | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 28. Lifting weights  | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 29. Sailing          | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 30. Gymnastics       | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |

|                             | Mark "yes"<br>or "no" for<br>Each activity |                                 | Number of times<br>in the last<br>four months                  | Average Number<br>of<br>Hours Minutes                          |
|-----------------------------|--------------------------------------------|---------------------------------|----------------------------------------------------------------|----------------------------------------------------------------|
| 31. Roller skating          | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 32. Canoeing                | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 33. Squash                  | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 34. Judo, Karate            | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 35. Ping pong, table tennis | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 36. Broomball               | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 37. Motorcycling            | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 38. Yoga                    | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 39. Floor, road hockey      | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 40. Calisthenics            | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 41. Other (specify) _____   | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 42. Other _____             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 43. Other _____             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 44. Other _____             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |
| 45. Other _____             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="text"/> <input type="text"/> <input type="text"/> | <input type="text"/> <input type="text"/> <input type="text"/> |

4. Circle one of the points on the scale below which best corresponds to where you would place yourself at the moment.

- Compared with other people my age and sex I would consider myself:

very much less fit . . . . . very much more fit

Social and Leisure Activity QuestionnairePART I:

|                                |                                                                                                                          |                                                                                                                                                         |                                                                |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| <b>1</b>                       | Please indicate with an "X" whether or not you have engaged in the following activity within the <u>last two weeks</u> . |                                                                                                                                                         |                                                                |
|                                | <b>2</b>                                                                                                                 | How many times within the <u>last two weeks</u> (Give the most accurate estimate possible) Did you engage in each activity marked "yes" in Question #1? |                                                                |
|                                | <b>3</b>                                                                                                                 | How much time did you usually spend doing this activity <u>on the average</u> on each occasion (Give the most accurate estimate possible).              |                                                                |
|                                | Mark "yes" or "no" for each activity                                                                                     | Number of times in the last <u>two weeks</u>                                                                                                            | Average Number of<br>Hours Minutes                             |
| no<br><input type="checkbox"/> | yes<br><input type="checkbox"/>                                                                                          | <input type="text"/> <input type="text"/> <input type="text"/>                                                                                          | <input type="text"/> <input type="text"/> <input type="text"/> |

| Activity                                                                     | Mark "yes"<br>or "no" for<br>Each activity |                                 | Number of times<br>in the last<br><u>two weeks</u> |                          |                          | Average Number<br>of<br>Hours Minutes |                          |
|------------------------------------------------------------------------------|--------------------------------------------|---------------------------------|----------------------------------------------------|--------------------------|--------------------------|---------------------------------------|--------------------------|
| 1. Watching T.V.                                                             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 2. Listening to the radio.                                                   | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 3. Listening to records, tapes,<br>or cassettes.                             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 4. Reading books for leisure.                                                | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 5. Reading newspapers,<br>magazines for leisure.                             | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 6. Socializing or visiting with<br>friends or relatives.                     | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 7. Engaging in a craft or<br>hobby (photography, sewing,<br>woodwork, etc.). | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 8. Doing yard maintenance,<br>home repairs.                                  | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |
| 9. Playing bingo, cards,<br>chess, other games.                              | no<br><input type="checkbox"/>             | yes<br><input type="checkbox"/> | <input type="checkbox"/>                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>              | <input type="checkbox"/> |

PART II:**1**

Please indicate with an "X" whether or not you have engaged in the following activity within the last four months.

**2**

How many times within the last four months (Give the most accurate estimate possible) Did you engage in each activity marked "yes" in Question #1?

**3**

How much time did you usually spend doing this activity on the average on each occasion (Give the most accurate estimate possible).

Mark "yes" or "no" for each activity

Number of times in the last four months Hours

Average  
Number of  
Minutes

no

☐

yes

☐

|  |  |  |
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2

Mark "yes"  
or "no" for  
Each activity

Number of times  
in the last  
four months

Average Number  
of  
Hours Minutes

Activity

|                                                                              |                                |                                 |                                                                            |                                                                            |
|------------------------------------------------------------------------------|--------------------------------|---------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1. Dancing.                                                                  | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 2. Attended a movie or other film.                                           | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 3. Attended a musical performance or recital.                                | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 4. Attended a live theatre production, ballet, or other dance performance.   | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 5. Attended a sports event as a spectator.                                   | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 6. Visited a cultural centre (museum, art gallery, etc.).                    | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 7. Visited a craft fair, festival, circus, zoo, or exhibition.               | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 8. Participated in community activities (i.e. church, service groups, etc.). | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 9. Other (specify) _____                                                     | no<br><input type="checkbox"/> | yes<br><input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |

Self-Assessment Scale

Mark an "X" in the blank that you feel most accurately describes your self-perception. Be sure to select the one you think you actually believe to be most accurate rather than the one you should choose or the one you would like to be true. This is a measure of personal opinion, therefore there are no right or wrong answers. Nonetheless, it is very important that you answer in as truthful a manner as possible.

-----

1. I feel that I'm a person of worth, at least on an equal plane with others.

A) \_\_\_\_\_ Strongly agree  
B) \_\_\_\_\_ Agree  
C) \_\_\_\_\_ Disagree  
D) \_\_\_\_\_ Strongly disagree

2. I feel I have a number of good qualities.

A) \_\_\_\_\_ Strongly agree  
B) \_\_\_\_\_ Agree  
C) \_\_\_\_\_ Disagree  
D) \_\_\_\_\_ Strongly disagree

3. All in all, I am inclined to feel that I am a failure.

A) \_\_\_\_\_ Strongly agree  
B) \_\_\_\_\_ Agree  
C) \_\_\_\_\_ Disagree  
D) \_\_\_\_\_ Strongly disagree

4. I am able to do things as well as most other people.

A) \_\_\_\_\_ Strongly agree  
B) \_\_\_\_\_ Agree  
C) \_\_\_\_\_ Disagree  
D) \_\_\_\_\_ Strongly disagree

5. I feel I do not have much to be proud of.

A) \_\_\_\_\_ Strongly agree  
B) \_\_\_\_\_ Agree  
C) \_\_\_\_\_ Disagree  
D) \_\_\_\_\_ Strongly disagree

6. I take a positive attitude toward myself.

A) \_\_\_\_\_ Strongly agree  
B) \_\_\_\_\_ Agree  
C) \_\_\_\_\_ Disagree  
D) \_\_\_\_\_ Strongly disagree

7. On the whole, I am satisfied with myself.

- A) \_\_\_\_\_ Strongly agree
- B) \_\_\_\_\_ Agree
- C) \_\_\_\_\_ Disagree
- D) \_\_\_\_\_ Strongly disagree

8. I wish I could have more respect for myself.

- A) \_\_\_\_\_ Strongly agree
- B) \_\_\_\_\_ Agree
- C) \_\_\_\_\_ Disagree
- D) \_\_\_\_\_ Strongly disagree

9. I certainly feel useless at times.

- A) \_\_\_\_\_ Strongly agree
- B) \_\_\_\_\_ Agree
- C) \_\_\_\_\_ Disagree
- D) \_\_\_\_\_ Strongly disagree

10. At times I think I am no good at all.

- A) \_\_\_\_\_ Strongly agree
  - B) \_\_\_\_\_ Agree
  - C) \_\_\_\_\_ Disagree
  - D) \_\_\_\_\_ Strongly disagree
-

### Asthma Symptom Checklist

Circle a point on the scale below, which best corresponds to your condition.

Typically, over the past 4 months I have experienced the following reactions during an asthmatic crisis:

- 
- |                                |       |           |        |
|--------------------------------|-------|-----------|--------|
| 1. Cramps                      | never | . . . . . | always |
| 2. Panting                     | never | . . . . . | always |
| 3. Numb                        | never | . . . . . | always |
| 4. Mucous congestion           | never | . . . . . | always |
| 5. Cranky                      | never | . . . . . | always |
| 6. Irritable                   | never | . . . . . | always |
| 7. Hard to breath              | never | . . . . . | always |
| 8. Headaches                   | never | . . . . . | always |
| 9. Edgy                        | never | . . . . . | always |
| 10. Frightened                 | never | . . . . . | always |
| 11. Uncomfortable              | never | . . . . . | always |
| 12. Short of breath            | never | . . . . . | always |
| 13. Chest congestion           | never | . . . . . | always |
| 14. Afraid of being left alone | never | . . . . . | always |
| 15. Afraid of dying            | never | . . . . . | always |
| 16. Frustrated with things     | never | . . . . . | always |
| 17. Heart pounding             | never | . . . . . | always |
| 18. Dizzy                      | never | . . . . . | always |
| 19. Rapid breathing            | never | . . . . . | always |
| 20. Worn out                   | never | . . . . . | always |
| 21. Panicky                    | never | . . . . . | always |
| 22. Weak                       | never | . . . . . | always |

|     |                          |                 |        |
|-----|--------------------------|-----------------|--------|
| 23. | Pins and needles feeling | never . . . . . | always |
| 24. | Don't care about things  | never . . . . . | always |
| 25. | Feel isolated            | never . . . . . | always |
| 26. | Wheezing                 | never . . . . . | always |
| 27. | Worried about the attack | never . . . . . | always |
| 28. | Angry                    | never . . . . . | always |
| 29. | Tingly in spots          | never . . . . . | always |
| 30. | Chest tightening         | never . . . . . | always |
| 31. | Tired                    | never . . . . . | always |
| 32. | Scared                   | never . . . . . | always |
| 33. | Furious                  | never . . . . . | always |
| 34. | Nervous                  | never . . . . . | always |
| 35. | Fatigued                 | never . . . . . | always |
| 36. | Helpless                 | never . . . . . | always |
| 37. | Chest filling up         | never . . . . . | always |
| 38. | Short tempered           | never . . . . . | always |
| 39. | Lonely                   | never . . . . . | always |
| 40. | Worried                  | never . . . . . | always |
| 41. | Chest pain               | never . . . . . | always |
| 42. | Exhausted                | never . . . . . | always |
| 43. | Mad at the world         | never . . . . . | always |
| 44. | Coughing                 | never . . . . . | always |
| 45. | No energy                | never . . . . . | always |
| 46. | Unhappy                  | never . . . . . | always |
| 47. | Worried about myself     | never . . . . . | always |
| 48. | Concerned about asthma   | never . . . . . | always |
| 49. | Concerned in general     | never . . . . . | always |
| 50. | Feel ignored             | never . . . . . | always |

Attribution Scale

The following questionnaire concerns what you personally think or believe about your own success or failure in dealing with asthmatic attacks. In some cases you may find that neither alternative is exactly what you believe. However, pick the alternative which best corresponds with what you believe to be the case. Do not leave any questions unanswered

-----

PART I: (A) FAILURE TO CONTROL ASTHMATIC ATTACK

Think back to the times when you felt an asthmatic attack beginning, and you were unable to prevent it or stop its effects.

Check one alternative (A or B) in each of the six questions below.

Would you say that your failure to stop an attack was because:

(Check only one: A or B)

1. ☐ (A) You are not good at controlling your asthma.

☐ (B) It is very difficult to control your asthma.

Considering the two possibilities above, indicate to what extent you think each is responsible for your failure to stop an attack. If you had 100 points to distribute between A and B above, how many points would you assign to A and how many points would you assign to B? (The total of A + B must equal 100)

A = \_\_\_\_\_ points  
B = \_\_\_\_\_ points

(Check only one: A or B)

2. ☐ (A) You are not good at controlling your asthma.

☐ (B) You do not try hard to control your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

3. ☐ (A) You are not good at controlling your asthma.  
☐ (B) You are usually ~~not~~ lucky in controlling your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
 B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

4. ☐ (A) It is very difficult to control your asthma.  
☐ (B) You do not try hard to control your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
 B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

5. ☐ (A) It is very difficult to control your asthma.  
☐ (B) You are usually not lucky in controlling your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
 B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

6. ☐ (A) You do not try hard to control your asthma.  
☐ (B) You are usually not lucky in controlling your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
 B is responsible for \_\_\_\_\_ points

PART I: (B) SUCCESS AT CONTROLLING AN ASTHMATIC ATTACK

Think back to the times when you felt an asthmatic attack beginning, and you were able to prevent it or stop its effects.

Check one alternative (A or B) in each of the six questions below.

Would you say that your success in stopping an attack was because:

(Check only one: A or B)

1. ☐ (A) You are good at controlling your asthma.

☐ (B) It is not very difficult to control your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

2. ☐ (A) You are good at controlling your asthma.

☐ (B) You try hard to control your asthma.

Considering the two possibilities, out of 100 points:

A is responsible for \_\_\_\_\_ points  
B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

3. ☐ (A) You are good at controlling your asthma.

☐ (B) You are usually lucky in controlling your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

4. ☐ (A) It is not very difficult to control your asthma.

☐ (B) You try hard to control your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points  
B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

5. ☐ (A) It is not very difficult to control your asthma.

☐ (B) You are usually lucky in controlling your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points

B is responsible for \_\_\_\_\_ points

(Check only one: A or B)

6. ☐ (A) You try hard to control your asthma.

☐ (B) You are usually lucky in controlling your asthma.

Considering the two possibilities above, out of 100 points:

A is responsible for \_\_\_\_\_ points

B is responsible for \_\_\_\_\_ points

PART II: (A) Generally, considering the times when you have not been successful in averting an asthmatic crisis, to what extent were each of the following responsible for your failure:

1. You are not good at controlling your asthma.

not at all . . . . . very much

2. It is very difficult to control your asthma.

not at all . . . . . very much

3. You do not try hard to control your asthma.

not at all . . . . . very much

4. You are usually not lucky in controlling your asthma.

not at all . . . . . very much

PART II: (B) Generally, considering the times when you have been successful in averting an asthmatic crisis, to what extent were each of the following responsible for your success:

1. You are good at controlling your asthma.

not at all . . . . .

very much

2. It is not very difficult to control your asthma.

not at all . . . . .

very much

3. You try hard to control your asthma.

not at all . . . . .

very much

4. You are usually lucky in controlling your asthma.

not at all . . . . .

very much

## APPENDIX D

PHYSICIAN'S LETTER OF APPROVAL

AND

EMERGENCY PROCEDURES FOR INSTRUCTORS

January 22, 1982.

Dear Dr.

I have recently started to participate in a research project on asthmatics at the University of Ottawa. The research team, consisting of individuals from Medicine, Kinanthropology, and Psychology, are investigating some biochemical, physical, emotional, and social effects of a physical exercise and respiratory retraining program on persons suffering from asthma. Various people have taken part in this program before and, while on the basis of their reports there is reason to believe in its effectiveness, this project represents the first attempt at scientifically and concretely documenting which people benefit, in which ways, and to what degree.

I have been selected as one of the 60 participants in the treatment program, which includes a physical exercise component during the 1 hr sessions, (3 times per week, for 16 weeks). The exercises are mild to moderate in intensity initially, and require more effort as one progresses through the program. The objective of this program is to supply the asthmatic with a coping skill through an education in the following:

- 1) To promote muscular relaxation.
- 2) To reduce anxiety.
- 3) To eliminate non-rhythmical respiration.
- 4) To decrease the respiratory rate, and increase efficiency.
- 5) To expel the trapped air in the lungs with the use of newly strengthened respiratory muscles.
- 6) To relieve bronchial spasms.

It is to be noted that this program is done with no devices apart from the subjects own muscular system and body.

The program organizers have made it quite clear, that if I should experience difficulties at any time during the program, I may freely (A) decide not to take part; (B) stop my participation at any time for whatever reason; and (C) participate at my own pace.

.../2

- 2 -

The program requires that we have the following filled out by a physician and returned as quickly as possible. I would appreciate your cooperation in this request.

Sincerely,

Having read the above letter, I know of the following medical conditions of this individual that might be influenced by this person's participation in the above described program.

CONDITION

1.

2.

3

Overall, I would:

(Please mark one)

☐ Recommend that this individual can safely participate in this program.

☐ Recommend that this individual cannot safely participate in this program.

Witness: \_\_\_\_\_

Physician's name: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

"IN CASE OF AN EMERGENCY....."

The instructor should realize that many asthmatics have a poor body image and a negative attitude towards exercises in general. This hesitation to participate in physical activities is due to the fact of provoking an attack by the exercise activity.

The instructor plays a "Vital Role" in helping the subject to relax and alleviate this anxiety right at the start of the program, which otherwise could create a great strain on the subject.

If "Exercise-induced-Asthma" should occur during the gymnastic program training the appropriate steps can be taken on either side, first the subject should inform the instructor at once if an attack is coming, and the instructor should be alert in keeping a "Vigil eye" on all the students in the class. The following signs may be present:

1) Rapid rate of breathing, irregular, some gasping of air, using accessory muscles such as sternocleidomastoids. During an attack the muscles in the neck and shoulders have a tendency to become tense and contract, this can make the attack more difficult, so the instructor should try to help the student "NOT TO PANIC" and "RELAX", the hardest thing to do during an asthma attack. Asthma can be very frightening for the subject as well as for the instructor, and getting tense makes the problem worse on either side. The instructor should try the upmost to appear calm, cool, and collected.

2) The expiratory phase of breathing is prolonged with audible wheezing and rhonci.

3) The subject may cough

4) The pulse rate may become rapid, the subject may become very pale, and the skin cold and clammy, if the breathing difficulty becomes worse.

Muscle relaxation can be a potent weapon against the attack, fascial muscle tension produces air-way constriction, even if you are not asthmatic. When you increase fascial muscle tension, your air-ways constrict, when you relax, the air-ways widen and you breathe more easy, so try during this critical period to tell the subject to smile, in smiling the neck muscles will relax.

A) Try to get the subject to sit down, talk gently to the student, but firmly, the back should be straight, arms hanging down loosely, on each side, legs slightly apart, shoulder -width, palms of the hands facing up, tell the subject to breathe slowly via the mouth with short, strong expirations.

B) If there is no real improvement in the condition of the student, the student can then lean forwards on the elbows practicing the short strong expirations.

C) . If it is not possible to sit down when the attack is coming, the next best thing is to lean against the wall for support, legs slightly apart, arms down in front of you, head slightly bent forwards, relax as much as possible and expire slowly through the mouth, pushing at the same time the back against the wall.

One important thing during the attack, is for the instructor to help the student to learn to control and to obtain a regular rate and depth of the breathing, in order to

- a) relax correctly
- b) improve the posture
- c) to keep the airways clear

Finally, it is important for the instructor to avoid the downward phenomena, when the student is tight and congested it is difficult to breathe, then the student panics, the tension increases, this tension leads to bronchial constriction and to more tension.

At the time of the attack, rhythmic expiratory breathing can be of a great value to provide muscle relaxation and also to provide a better ventilation and more oxygen.

The secret for the instructor is to notice the stress right at the beginning in order to avoid a full developed attack, be on the alert, and try as much as possible to be CALM YOURSELF.....

## APPENDIX E

RESPIRATORY AND PHYSICAL RETRAININGPROGRAM MANUAL

Respiratory and Physical Retraining  
Program Manual

University of Ottawa

## Respiratory and Physical Retraining Program

Asthma is presently defined as a disorder of the airways, characterized by increased responsiveness of the tracheobronchial tree to many different stimuli. The major symptoms (of which you are all too familiar!) are shortness of breath, grasping, coughing, wheezing, and thoracic constriction.

Surprisingly, asthma is a condition that is quite common, and can cause significant disability and disruption of regular life patterns. It is estimated that a total of 14 million (or 7 percent of the population) Americans either have been in the past, or are presently, handicapped by asthma. You certainly are not a rarity!

The function of the respiratory system is to exchange gases between the atmosphere, and the body tissues, so that the cells may obtain the oxygen they require and remove their waste product carbon dioxide.

There is very strong physiological evidence that we can voluntarily control our respiratory functions. This breathing function, which supports life itself, is one of the few bodily functions which we can control. However, it is often ignored or taken for granted - until one experiences breathing difficulties.

Most North Americans, weakened by our sedentary life, have lost the necessary muscular strength to breath efficiently while under physiological stress. The weaker muscles do not allow for proper air exchange.

Asthmatics, due to their condition, tend to develop faulty breathing habits. Their upper chest becomes overworked, and the lower chest becomes "lazy". The abdominal and other muscles must be strengthened in order to enable the asthmatic to breath more efficiently.

The purpose of this program is to re-educate and strengthen these auxiliary muscles, as well as improving overall level of physical fitness. The goals of this program are -

- 1) To maximize the use of the respiratory muscles.
- 2) To learn how to use these exercises to stop an asthmatic crisis.
- 3) To improve exercise tolerance.
- 4) To develop a sufficient level of fitness so that one can pursue other recreational and social activities without concern of provoking an asthmatic crisis.

Exercise in general has experienced a tremendous increase in popularity in the past decade - as noted by the current interest in "Participaction" programs, jogging, swimming, racquet sports, etc. This trend reflects the growing awareness of the benefits of exercise. For example, it is known that regular physical activity improves cardiovascular and respiratory fitness (i.e. heart, circulation and lungs), as well as muscular strength and endurance. Not to mention that exercise can be enjoyable!

This program has been designed specifically with asthmatics in mind, since they frequently cannot participate without taking medication or experiencing a crisis. The exercise format is designed to progressively increase the level of physical fitness while minimizing the all too common asthmatic crisis. However you should remember the following important points -

- 1) Each person has a different exercise ability depending on their fitness level and severity of their asthma - don't compare yourself with others or push yourself to extreme discomfort; this is not the way to progress.
- 2) Build-up the exercise training gradually, but consistently.
- 3) A short relaxation period between exercises must be included. This is best done by lying on the floor, legs and arms completely relaxed, the mouth half opened, the lower jaw relaxed ("idiot look").

## Respiratory Program

The real physiological breathing of human is "deep diaphragmatic breathing" apparently unknown by the majority of people. In this breathing mechanism the EXPIRATION holds the most important part, with the aim of a complete emptying of the pulmonary air, contrary to what most people in the world are doing during a physical effort.

Humans are always trying to take in as much air as possible which causes "STRESS" on the heart and results in the very well known "OUT OF BREATH" phenomena which is in reality too much air in the lungs.

Deep diaphragmatic breathing is completely opposed to the partial thoracic breathing mechanism; thoracic breathing is used by the majority of people, especially more in the Western countries, as opposed to the Orient.

Thoracic breathing gives to the inspiration the major rôle, the aim to take in as much air as possible into the lungs. During this systematic inspiration the shoulders and the ribs lift and the thoracic cage contracts up, causing a compression of the heart. In deep diaphragmatic breathing the diaphragm alone performs the displacement of approximately 4 cm up, the shoulders remain absolutely still and the thoracic cage enlarges laterally and not vertically, there is no compression of the heart.

The expiration has a major duty, the inspiration is performed automatically in relation with the amplitude of the emptying of the expiration.

The expiration is active in diaphragmatic breathing, and the inspiration is passive, whereas in thoracic breathing the inspiration is active, and the expiration is passive.

We should notice that at birth the first inspiration, which fills the lungs of the newborn, passes unnoticed. On the other hand, his first expiration is manifested by a "wailing", with which the energy and the vocal strength are a reassuring test for the Doctor. From birth, nature shows us the real breathing mechanism of the human being.

During a physical effort, the systematic use of the inspiration first, creates the famous and so frequent "breathlessness", which is in reality too much air, or a surcharge of air in the lungs, and consequently tires the heart.

This breathing gymnastic is performed on a precise rhythm of counting, which should always be present during a performance of the exercises, either by the instructor or a recorded cassette. This unique rhythm is -

|             |                    |
|-------------|--------------------|
| EXPIRATION  | 5 beats or seconds |
| BLOCKAGE    | 3 beats or seconds |
| INSPIRATION | 3 beats or seconds |

EXPIRATION : is always spontaneous, which means emptying the lungs without taking some air in first, each exercise starts by spontaneous expiration.

BLOCKAGE : is to hold and stop the breathing work, the mouth should be kept closed, no swallowing or moving of the mouth or the rest of the body.

INSPIRATION : this is done on a slow rhythm which characterizes the control of breathing.

RELAXATION PERIOD : the rest period is between each set of exercises, which consists of a complete decontraction of the body, with slow and gentle expirations, this is as important as the gymnastic itself.

The rest period is as follow: - lying on the floor, legs and arms completely relaxed, the mouth half opened, lower jaw decontracted (idiot look ... ) don't be ashamed to do it, blow slowly using spontaneous expiration; during the rest period listen carefully to the explanation of the next exercise.

"Always try to smile when you do this breathing gymnastic, if you are laughing you control your abdominal muscles."

Exercises, particularly "breathing exercises" appear to be of value to asthmatics, by strengthening their respiratory muscles and providing better ventilation. In diaphragmatic breathing, the diaphragm, a major respiratory muscle, can be strengthened with regular exercise; the proper use of this muscle can help to remove trapped air in the lungs and give more effective air exchange.

Most of us take the working mechanism of our body for granted, when things go well, we do not worry, we eat food, enjoy it and digest it, our heart beats pumping blood to all the parts of our body, we breathe, oxygen goes to the body, combustion takes place, we are not conscious of all those functions, then suddenly something goes wrong, breathing is difficult, your chest feels tight, shortness of breath with audible wheezing, often you get a cough which is either dry or produces phlegm. ASTHMA.

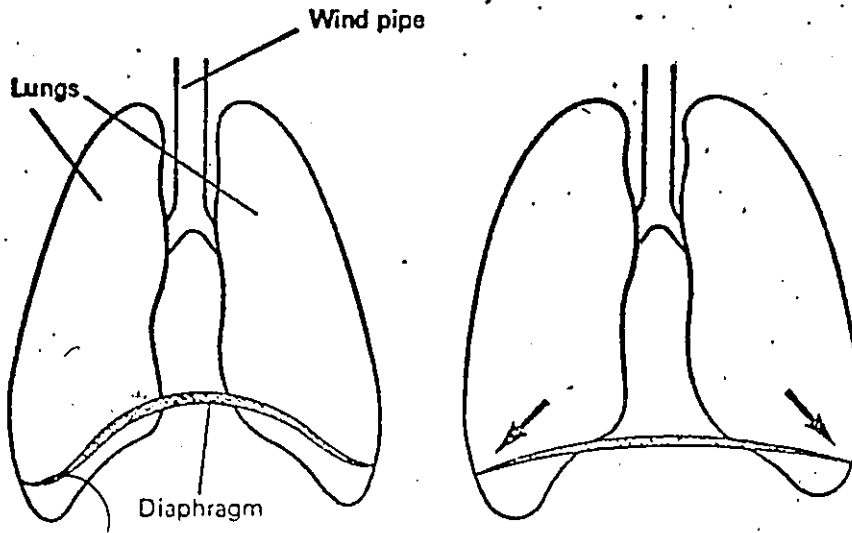
Asthma, this word comes from the Greek, meaning "Panting". This condition is common, affecting either sex in all age groups. Asthma can be divided into two main groups:-

1) Intrinsic asthma: The cause of the trouble is inside the body of the person, the person carries it with him or her at all times, no matter where he or she is going.

2) Extrinsic asthma: The cause of the trouble is due to sensitivity to dust, pollens, molds and foods, there is hypersensitivity to one or more substances.

Normally, the air we breathe passes through a network of small bronchial tubes and smaller bronchioles into microscopic sacs, the alveoli, where tiny capillaries bring individual blood cells to receive their precious oxygen. During an asthmatic attack, the muscles in those little bronchial tubes constrict, closing off the airways. The tiny bronchioles begin to plug with thick secretions of mucus, so little air can get in, and less air can get out.

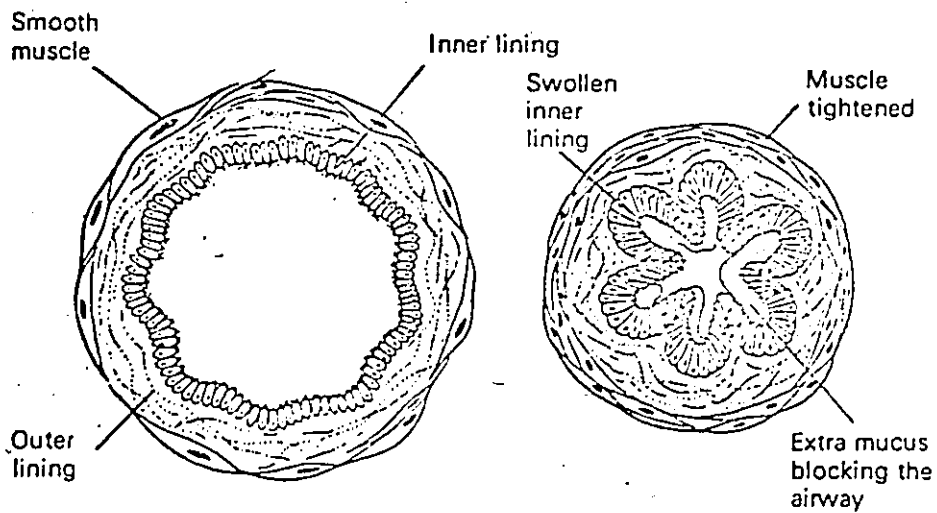
### How the diaphragm works



a) Breathing out  
- the diaphragm at rest

b) Breathing in  
- the diaphragm flattens

### A cross-section of a bronchial tube, showing what happens during an asthmatic attack



a) Normal

b) During an attack

EXERCISE : 1

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CLEARANCE OF THE NOSE ( nose-nose breathing ). This exercise is performed sitting on the floor.

- 1- Close right nostril with the right thumb, expire via the left nostril.
- 2- Close left nostril with the right index finger, inspire via the right nostril.



This exercise is done fast, with no break between the breathing noise of the expiration and the inspiration, at all time keep the mouth closed.

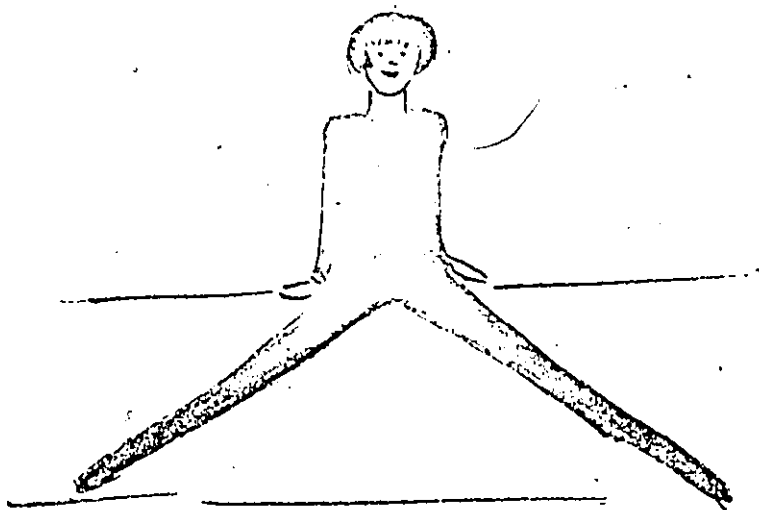
Perform 10 times, rest, repeat on the left side.

DONOT FORGET THAT EVERY EXERCISE IS STARTED WITH THE SPONTANEOUS EXPIRATION.

## EXERCISE: 2

IMMOBILITY ON THE FLOOR ( Sitting position, mouth-nose breathing, fast rhythm ).

- 1- Sit with the legs slightly apart, shoulder-width, back straight, shoulders pulled back.
- 2- Arms placed on each side of the chest, hands in contact with the floor.
- 3- In this position, not moving, looking ahead with the head straight, the breathing exercise is done with spontaneous expiration via the mouth, inspiration via the nose.

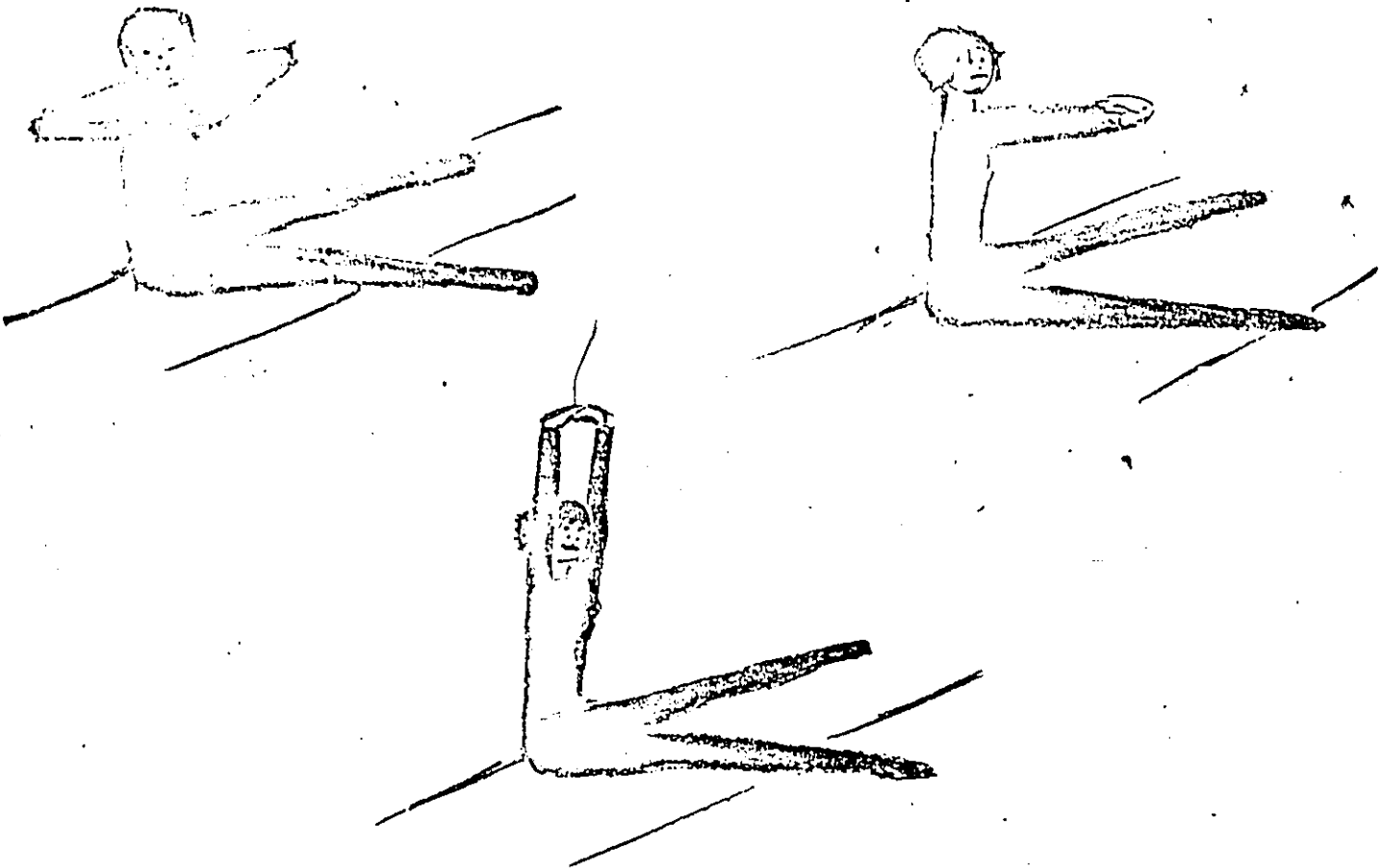


The breathing count is fast , 1;2;1;2; exercise is done 6 to 10 times, then rest period. Relax the arms, bend over gently resting the elbows and arms on your legs, empty slowly via the mouth.

## EXERCISE; 3

ARMS EXTENSION WITH ROTATION OF HANDS (mouth-nose breathing, fast breathing rhythm )

- 1- Hands placed with palms across the chest, fingers interlocked elbows horizontal
- 2- Back straight, head in alignment, looking straight ahead, shoulders pulled back.
- 3- Extend arms in front of you, with palms of the hands outwards, fingers interlocked. ( expiration via the mouth )
- 4- Bring back arms to initial position ( inspiration via the nose )
- 5- Extend arms above the head, arms touching the ears, palms of the hands outwards, fingers interlocked. ( expiration via the mouth )
- 6- Return to the initial position. ( inspiration via the nose )

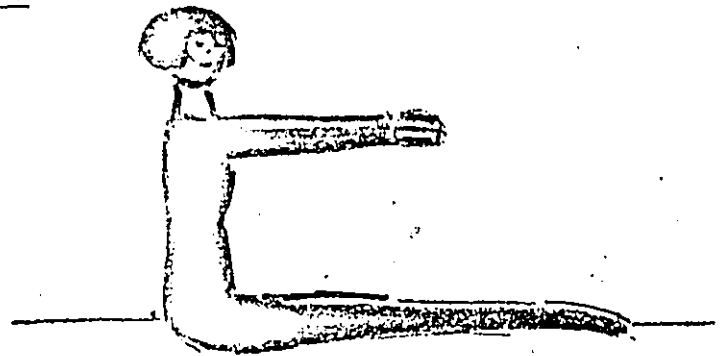
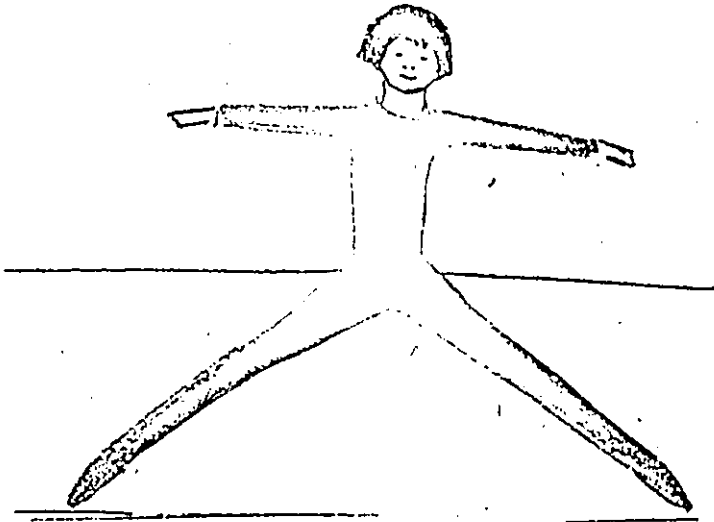


This exercise is done with the rapid count -1, 2, 3, 4, repeat exercise 5 times, then rest period, later when the student is more advanced, the exercise can be repeated several times. Do not forget the rest period at the end of each set of exercises.

EXERCISE : 4

ARM EXTENSION ( horizontal position, mouth- nose breathing )

- 1- Sitting on the floor, legs slightly apart, shoulder-width, arms outstretched on each side of the body in the horizontal position, keep arms level, fist closed.
- 2- Bring arms in front of you in a rapid movement, maintaining the arms straight, stop when the arms are paralld in front of you. ( Spontaneous expination via mouth )
- 3- Return the arms to the initial position ( inspiration via the nose )
- 4- Keep head straight aligned with the upper part of the body,



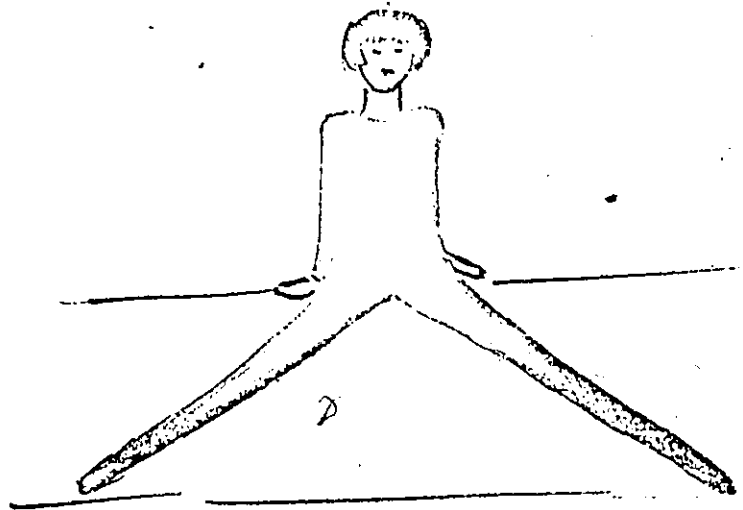
This exercise is done with the rapid count-1-2;1-2; 1-2; 1-2; repeat exercise 5 times, then rest period, bend over gently, resting arms on your legs, breathe slowly via the mouth.

EXERCISE: 5

IMMOBILITY ON THE FLOOR ( Sitting, mouth-nose breathing with blockage )

- 1- Sit legs slightly apart, shoulder -width, back straight, shoulders pulled back.
- 2- Arms placed on each side of the chest, with the hands firmly touching the floor, no gap between the arm and the side of the chest.
- 3- Keep head straight, do not move it during the breathing cycle.

|             |           |
|-------------|-----------|
| EXPIRATION  | 5 seconds |
| BLOCKAGE    | 3 seconds |
| INSPIRATION | 3 seconds |



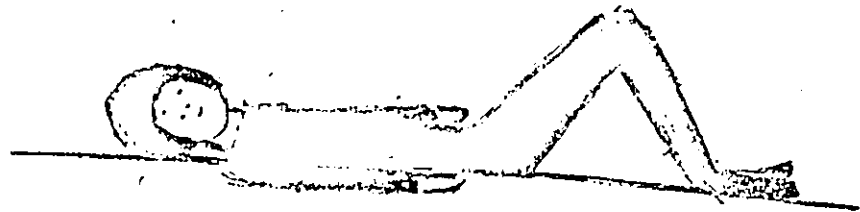
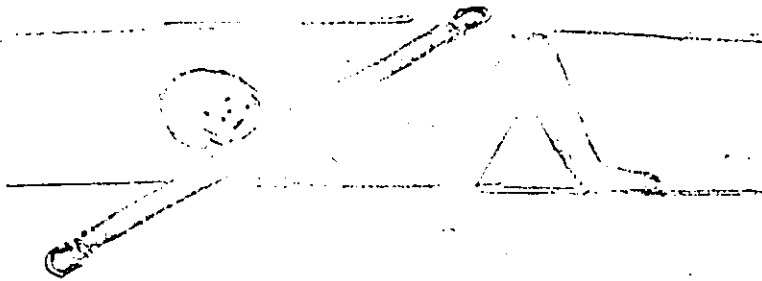
In this exercise you are now learning the slow breathing rhythm with the use of the "Blockage" which is the immobility of the the muscles in the body , you should not move during this 3 second period, holding your muscles in a relax manner not contracted.

Exercise is done 4 to 5 times at first, then increased later, rest period follow, bend over gently, knee decontracted and arms resting down, Breathe slowly through the mouth.

EXERCISE:6

ARM EXTENSION ON THE FLOOR ( lying down, mouth-nose breathing )

- 1- Head, back , and feet are, in firm contact with the floor
- 2- Legs are folded, knees and feet together
- 3- Arms are extended out on each side of the chest in the horizontal position, fingers together.
- 4- Bring arms down towards the chest, touching the sides of it. ( Spontaneous expiration via mouth )
- 5- Return arms to the initial position ( Inspiration via the nose )

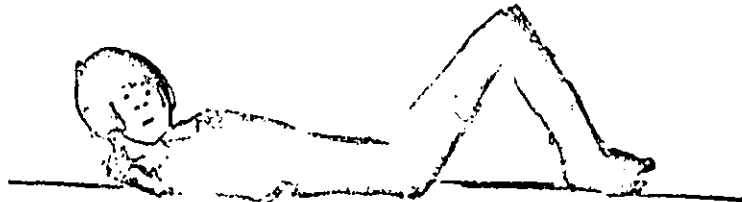


In this exercise the breathing rhythm is rapid, count is 1-2;1-2; 1-2;1-2; exercise is done at first 5 times, later increased to 10 times. Rest period, arms down, breathe slowly through the mouth.

EXERCISE: 7

IMMOBILITY ON THE FLOOR ( Mouth-nose breathing )

- 1- On the floor, back pressing hard the floor, legs folded, feet and knees together touching the floor.
- 2- Hold head with your hands at the base of the skull, chin and elbows on the chest.
- 3- The breathing work is rapid, spontaneous expiration via the mouth, then inspiration via the nose, the expiration must sound loud, smile at the same time.
- 4- The exercise is done by raising the head at the expiration the chin is in contact with the chest, elbows touching the chest, at the inspiration the head return to the initial position.



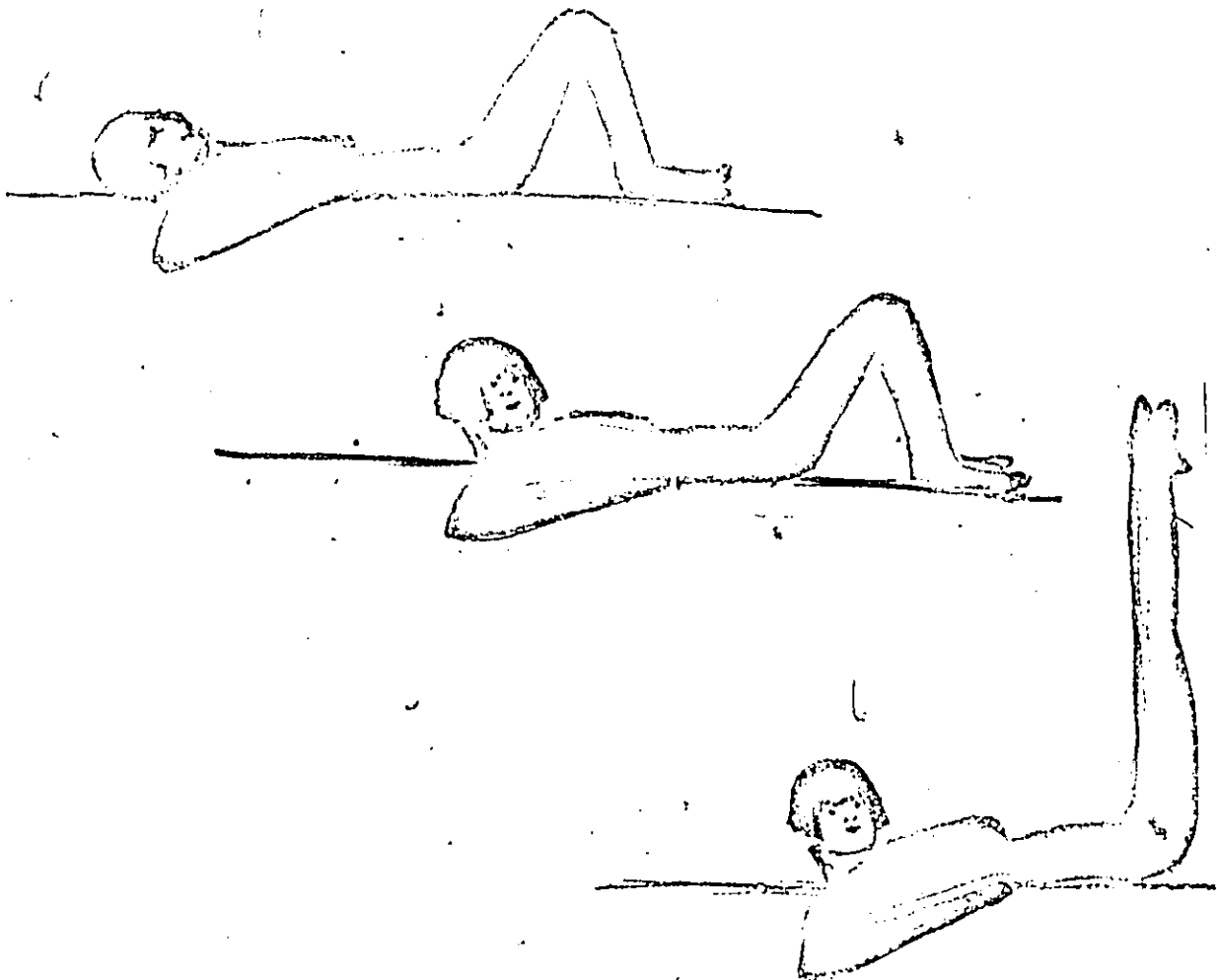
In this exercise you learn to control the abdominal muscles, pushing strongly the floor with your back, you also start to strengthen the muscles of your neck, and you are getting to improve the lumbar curvature of your back.

Exercise is performed 10 times, then rest period, place arms along the body and empty slowly via the mouth, later repeat the exercise.

EXERCISE :8

TEST OF THE OBLIQUE MUSCLES ( Mouth-nose breathing with blockage )

- 1- Head, back, and feet in firm contact with the floor
- 2- Legs folded, knees and feet together, tips of fingers placed at the last rib on each side of the chest.
- 3- Expire in 5 seconds raising at the same time the head and placing chin on the chest.
- 4- Chin stays on the chest, back well in contact with the floor you blockage for 3 seconds, not moving the body.
- 5- Chin still on the chest, legs are pulled vertically towards the ceiling during the inspiration of 3 seconds, feet and knees together, do not bend knees.
- 6- You return to the initial position using the expiration of 5 seconds.

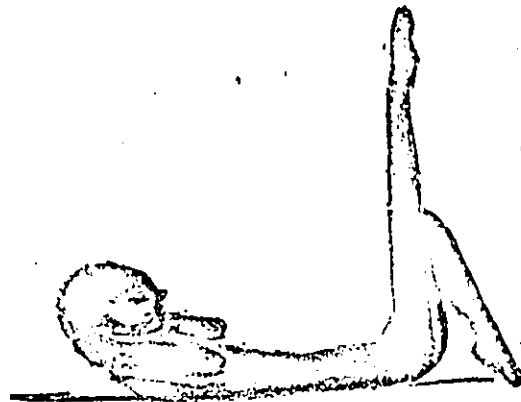


During this exercise you should fill the work of the oblique muscles, learn to tighten them, at first exercise is done 3 to 5 times, later you can increase to 8 times. Rest period at the end of the exercise.

EXERCISE: 9

BICYCLE ( Legs in the vertical position, spontaneous expiration, rapid rhythm )

- 1- On the floor, back well in contact with the floor
- 2- Chin on the chest, back of the head held with the hands, elbows on the chest.
- 3- To start both legs are in the vertical position
- 4- Breathing is rapid, noisy spontaneous expiration via the mouth. Legs work alternated and should bounce back after the heels have touched firmly the buttocks.



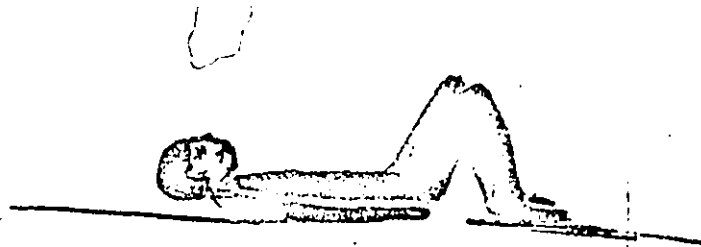
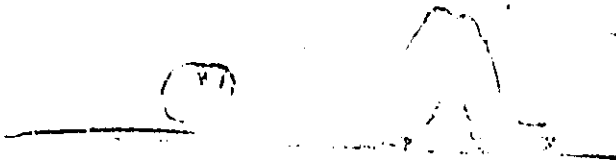
This exercise is to start to learn the spontaneous rapid expiration, the air will come through the nose automatically in between each expiration, mouth should close rapidly between each expiration. First 10 to 12 times the exercise is done, later it can be increased. Relax period at the end, breathe slowly via the mouth, legs down, arms down along the side of the body.

EXERCISE: 10

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ELEVATION OF THE PELVIS ( Mouth-nose breathing )

- 1- Back, head and feet are firmly in contact with the floor at the start of the exercise.
- 2- Raise the pelvis very slowly supporting yourself on your arms and shoulders, make sure the knees are together as well as the feet. ( Expiration in 5 seconds ).
- 3- You stay with the pelvis up, do not move and blockage for 3 seconds.
- 4- Going down slowly to the initial position inspire in 3 seconds.



In this exercise you are learning to concentrate to tighten your abdominal muscles and hold your back as well as to keep some balance with your body. Exercise is done 4 to 5 times at first, rest period, relax with legs and arms down, breathing slowly via the mouth.

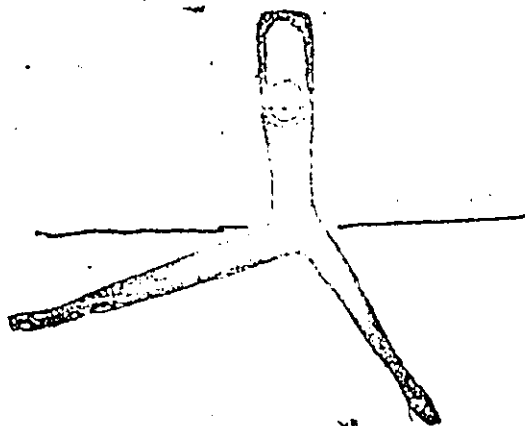
EXERCISE :11

FLEXION OVER THE LEGS HALF CIRCLE ROTATION . ( Spontaneous expiration noisy and rapid rhythm )

1- Sitting on the floor, legs slightly apart, shoulder -width, bust bend down over in between the legs with the arms extended over the head, palms of the hands up, head straight with the ears in contact firmly with the arms.

2- Rotate from right to left in a swinging manner using spontaneous expiration, keep head at all time between the arms, and try gradually to flex more on to the knee.

The count is 1-2; 1-2; 1-2; 1-2;



In this exercise you are starting to use your body in a more flexible manner in order to bring you more limeness to your body.

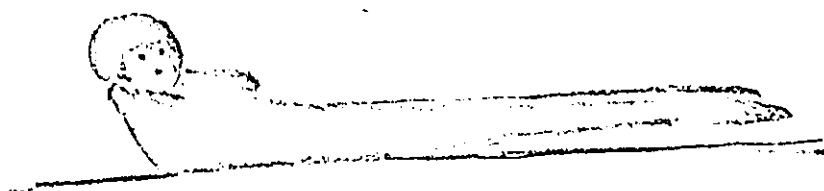
The exercise can be done 4 to 6 times at first, then relax period.

EXERCISE :12

213

BICYCLE ( Legs in the horizontal position, spontaneous expiration, rapid rhythm )

- 1- On the floor, back well in contact with the floor
- 2- Chin on the chest, back of the head held with the hands, elbows on the chest.
- 3- To start the back and the legs are in contact with the floor, the legs work alternately, keep feet well extended, legs coming very near the floor without touching.
- 4- Spontaneous expiration, fast and noisy, count 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

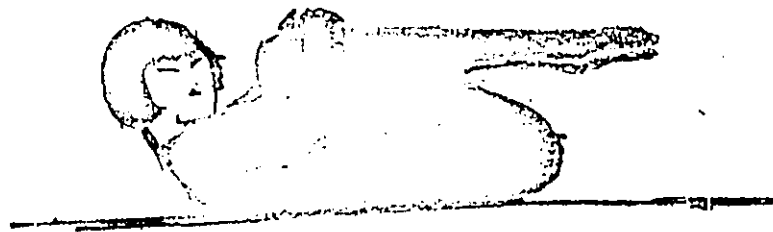
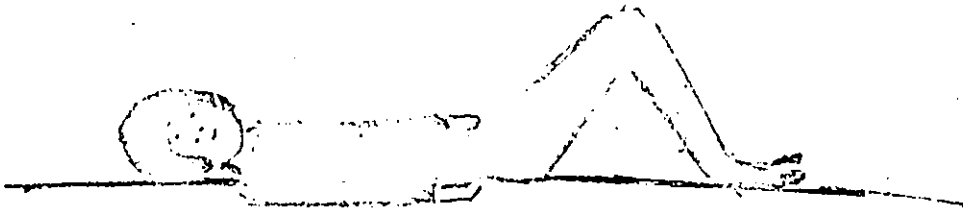


In this exercise you will start to use the abdominal muscles as well as to strengthen you back, pull hard on the head so you avoid having a lumbar curvature, ( little space in the back like a bridge.) Exercise is done 8 to 10 times at first, then rest period.

EXERCISE :13

BACK STRETCHING : ( Mouth-nose breathing )

- 1- Head, back, and feet are in firm contact with the floor, the legs are folded, the knees together as well as the feet.
- 2- Bring the legs towards the chest in a slow manner, keeping the legs together, at the same raise the head from the floor and place chin on the chest and grasp the folded limbs with your hands in order to form a ball, knees in contact with the chin. ( expiration of 5 seconds )
- 3- Stay in this position for the period of blockage 3 seconds
- 4- Return to the initial position during the inspiration of 3 seconds.



This exercise is to bring some muscle work of the neck as well as to improve the flexibility of the back. Exercise is done at first 3 to 5 times, rest period to follow.

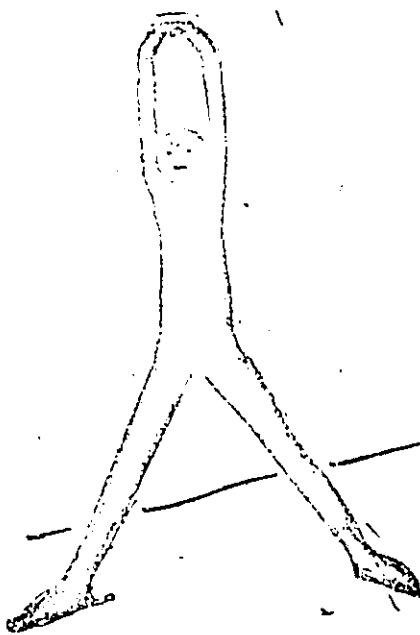
## EXERCISE:14

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THE BELL ( Part 1; Mouth-nose breathing )

- 1- This exercise is done standing, back straight, shoulder pulled back, legs apart, shoulder-width.
- 2- Place arms along the ears on each side of the head with palms of hands upwards towards the ceiling, fingers interlocked, but not held contracted.
- 3- Always keep your arms touching your ears, do not push arms either backwards or forwards.
- 4- In this position the breathing part of the exercise is done as follow:

|            |           |
|------------|-----------|
| Expiration | 5 seconds |
| Blockage   | 3 seconds |
| Inspire    | 3 seconds |



In this part one of the Bell exercise the breathing is done with the entire body, and during the inspiration you pull very hard on your arms up towards the ceiling, do not move the body during all the breathing period, repeat 3 to 5 times at first, rest period, relax, bending down gently as low as you can, arms relaxed, dangling on each side of the body, breathe slowly via the mouth.

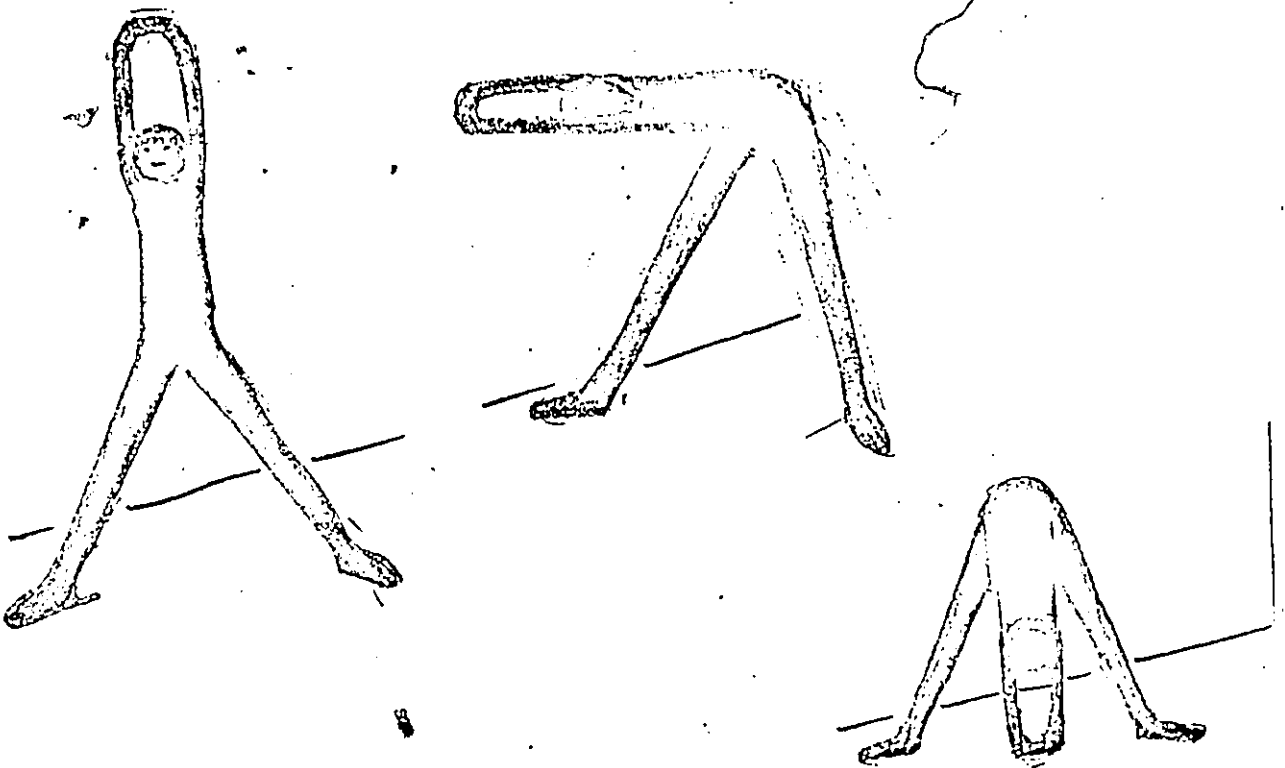
EXERCISE: 15

THE BELL ( Part 2; Mouth-nose breathing )

- 1- The exercise is done standing, back straight, shoulders pulled back, legs apart, shoulder-width.
- 2- Arms are on each side of the head touching firmly the ears, palms of hands upwards towards the ceiling, fingers interlocked but not held contracted.
- 3- Keeping this position of the exercise the breathing is done as follow:
 

|             |           |
|-------------|-----------|
| Expiration  | 5 seconds |
| Blockage    | 3 seconds |
| Inspiration | 3 seconds |

Do not move the body during this part
- 4- Going down towards the floor slowly, pull hard when you pass the vertical part, then go to the floor as far as you can, do not force your back, keep your arms in contact with the ears, and if you touch the floor push the floor with the palms of the hands. ( Expiration-5seconds for the going down period.
- 5- Stay in this position . ( Blockage for 3 seconds )
- 6- Coming up, pull hard on the arms towards the ceiling, keeping always the head between the arms. ( Inspiration- 3 seconds. )



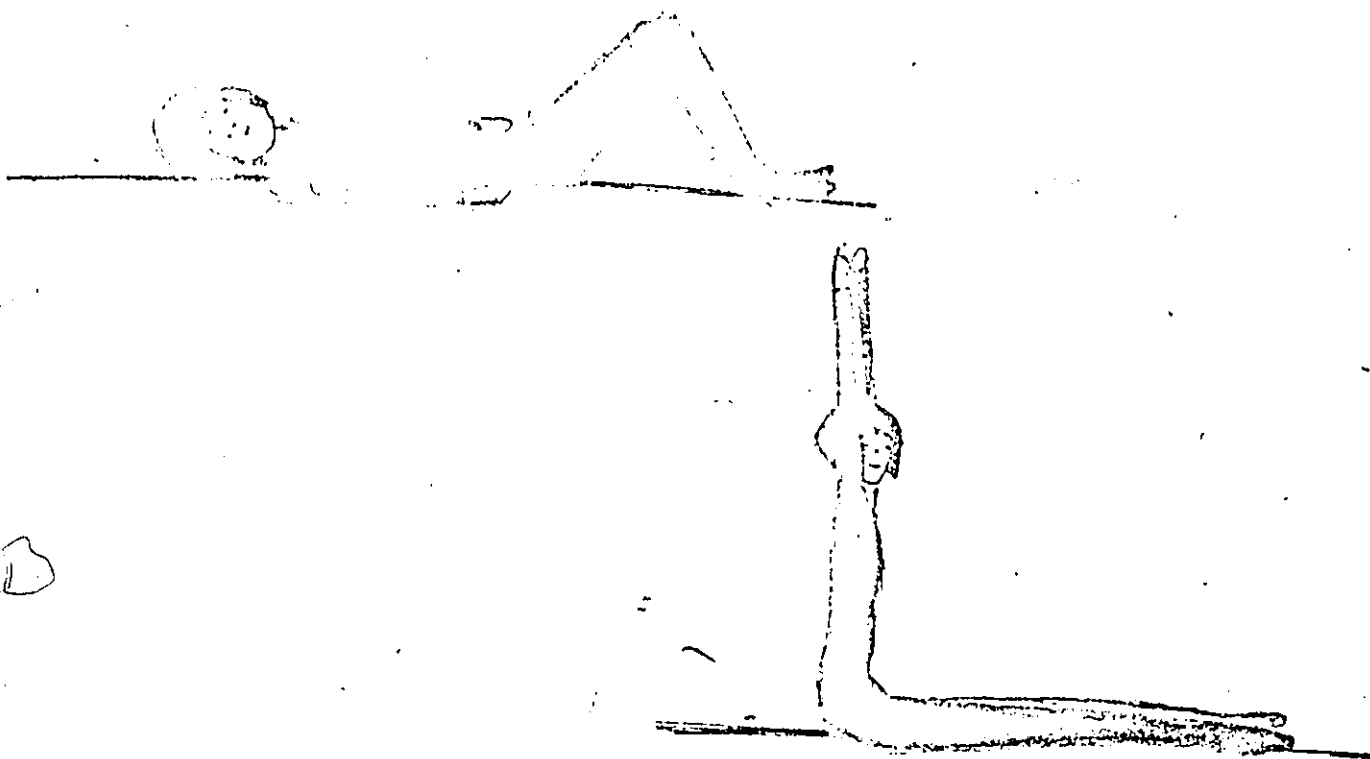
This exercise will bring suppleness to the back, exercise is done at first 3 to 5 times, rest period, relax., bending down gently as low as possible, arms relaxed, dangling on each side of the body, breathe slowly via the mouth.

EXERCISE: 16

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SIT UPS : ( Mouth-nose breathing - The little chair )

- 1- Head, back on the floor
- 2- Legs folded, knees together, arms along the upper part of the body.
- 3- Raise the trunk rapidly , arms stretched and touching the ears. ( Expiration - 3 seconds )
- 4- Stay in that position, pulling hard towards the ceiling .  
( Blockage - 3 seconds )
- 5- Return to the floor in a slow manner. ( Inspiration-3 seconds )

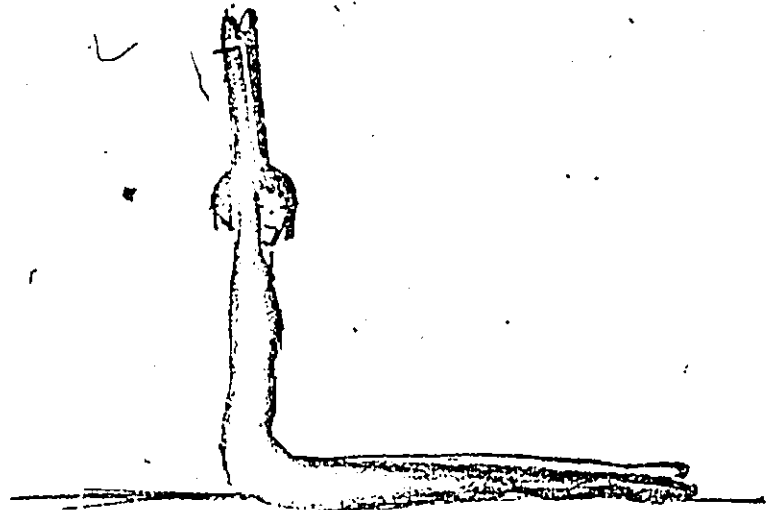
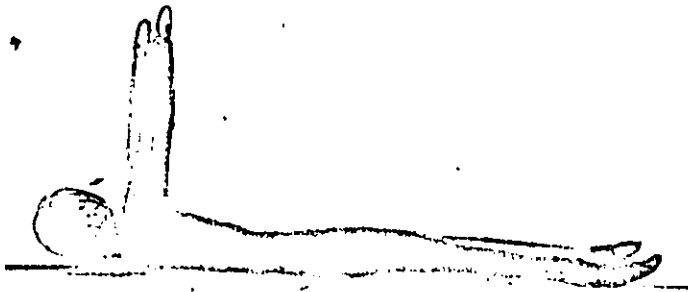


This exercise is for the person with a weak back and weak abdominal muscles. Practice 3 to 5 times at first, then rest period, relax, either lying down on the floor, arms decontracted, breathe slowly via the mouth, or sitting, bending over in a decontracted manner, breathe slowly via the mouth.

EXERCISE: 17

RAISING FROM THE FLOOR ( Mouth- nose breathing )

- 1- Head on the floor with the back and both legs well in contact with the floor, arms extended above the head.
- 2- Raise the trunk rapidly, do not elevate the feet or the legs from the floor. ( Expiration- 3 seconds )
- 3- Stay immobile in the sit up position, pull on your arms towards the ceiling. (Blockage - 3 seconds )
- 4- Go down to the floor very slowly, pull on the arms at the same time. ( Inspire - 3 seconds )



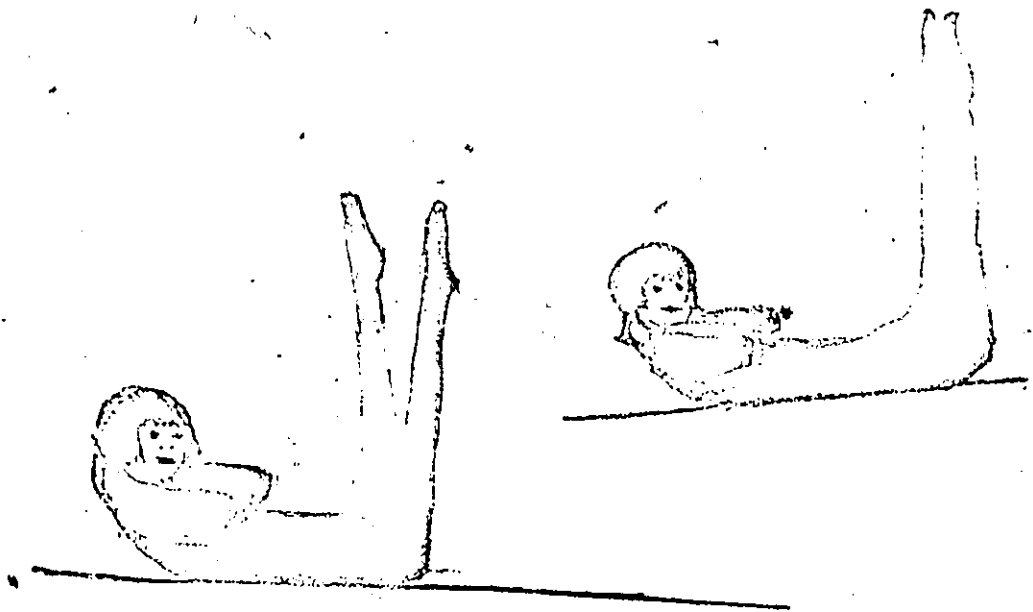
This exercise is done when the back is strong, as well as the abdominal muscles. Exercise is done 5 times at first. Rest a period, relax. Breathe slowly via the mouth with the arms and the body decontracted, either in the lying down position or sitting.

EXERCISE: 18

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LEG BEATS : ( Vertical position . Mouth breathing , spontaneous expiration )

- 1- Back is in contact with the floor
- 2- Chin on the chest, holding head at the base of the skull with the hands.
- 3- Legs are in the vertical position, do not bend the knees, keep toes extended, do not project legs outside the body , but inside.
- 4- Fast alternated movements of the legs, breathing via the mouth, spontaneous expiration.



For this exercise strong abdominal and dorsal muscles are required. The breathing is fast and spontaneous via the mouth, the inspiration will be automatically executed via the nose as the mouth closes in between each spontaneous expiration. Practice exercise at first 10 times, increase later. Rest period, relax, breathing slowly via the mouth.

## APPENDIX F

DRUGS PROGRAM MANUAL

7

"A drug is used to prevent, treat, or cure a disease" .  
Used respectfully and intelligently, drugs are a life saving boon,  
used unwisely, they can produce irreparable tragedy....

Facts about drugs are often difficult to obtain and a mystery to the patient taking them.

Why I am given this Medicine ?  
Is it helping me ?  
How can I find out more about it ?  
Why the dose I am taking so large ?  
Why I am taking so many different drugs ?  
Where can I find an answer ?

The answer may not be in this little chat with you, but we would like to try to help in some ways to place together the pieces of this large 'Drug - puzzle ".

Drugs are substances used as medicine. The word comes from the Dutch, "DROOG" meaning dry, its use is probably due to the fact that dried plants at first found the greatest source of medicines.

Drugs include:

Chemical substances such as bismuth, sodium salicylate or of mineral origin as the salts of iron.

Plant parts such as digitalis, opium, belladonna, Antibiotics are also from plant products, since they are obtained mainly from bacteria, molds.

Animal products, such as Epinephrine, Heparin, Thyroxin, Insulin and vaccines.

Certain food substances such as vitamins, amino-acids, blood products and glucose.

### ACTION OF DRUGS

Most drugs in themselves do not cure a disease, but materially aid that power which is known as "Nature " to complete the process, in other words, no drug can make a tissue perform functions for which it is not physiologically adapted. It may cause the damaged tissues or organs to perform better or more efficiently during the acute stage of the disease, but the drug will not produce new miracles.

Many drugs are of great values in the treatment of a disease. The purpose of any therapeutic prescription is:

- 1) To remove or destroy the causative agent
- 2) To relieve the symptoms
- 3) To restore normal metabolism
- 4) To restore the organism or tissue to the state called " Normal Health"

5) The important thing to remember is that the dose requirements are not the same in each person and it may vary considerably with each individual.

The administration of the drug can be:

- 1) Local : such as the application of a cold cream to the skin, or nasal spray on the mucous membrane in the nose.
- 2) Systemic : in this case the action of the drug on the tissue or organ is remote from the site of application, and the absorption occurs in the blood stream.

Example: If Morphine is given by an injection into the tissues of the arm, it is absorbed into the blood stream and carried to the brain where it exerts its chief action.

The proper action of a drug depends upon the following points:

- 1) drug must be administered in a correct manner so it will be introduced into the body advantageously.
- 2) drug must be absorbed in order to give some relief to the diseased organ.
- 3) the drug must reach the specific cells of the body.
- 4) the drug must be excreted or oxidized in the body.

Many factors are capable of modifying the action of a prescribed drug and must therefore be given consideration in determining proper dosage. Such factors include, age, weight, and condition of the patient, and method of administration as well as factors related to tolerance and idiosyncrasy, ( abnormal susceptibility to some drug ).

### THERAPEUTIC ACTION OF THE DRUG

The action of a drug in a well person and in a sick individual may be quite different. For example thyroid extract may relieve the symptoms of a person lacking of thyroid secretion ( Hypothyroidism ) and make the person well, on the other hand the action of this same drug in a normal individual may result in the oversecretion of the thyroid ( Hyperthyroidism ).

1) Side Action or side effect of a drug is the action of a drug other than the one for which it is given.

Example: When Morphine is given as an analgesic ( to relieve pain ) it also causes constriction of the pupils, this is a side action

2) Untoward action: when the side action becomes more or less harmful it is known as an untoward action. The action of Morphine which results in nausea and vomiting and in habit formation is undesirable and harmful.

3) Antagonistic action : two or more drugs which have an opposite effect on an organ are said to be antagonistic, it can be valuable in counteracting in case of poisoning.

4) Cumulative action : Some drugs are excreted so slowly that the whole of the dose is not eliminated before the next dose is given. The accumulation in the body of such a drug can become toxic, if administration is prolonged. Such drugs as mercury, iodine and digitalis have a cumulative action.

5) Synergistic action : Drugs which have a similar effect on an organ may be additive or synergistic. When two or more drugs are given together,

each aids the effect of the other and the combined effect, or the additive action is often greater or more satisfactory than if only one drug is given.

Example: Caffeine plus acetanilid are given together for headache relief.

6) Idiosyncrasy : is an unusual response to a drug, it may manifest itself by

- a) abnormal susceptibility
- b) abnormal tolerance
- c) different effect than the drug should do, such as excitement/ delirium.
- e) abnormal symptoms

7) Tolerance : is an acquired reaction to a drug in which the dose must be progressively increased in order to maintain a given therapeutic response.

8) Habituation : is a condition which is characterized by the strong desire or craving for a drug when it has been discontinued. When the psychic influence is strong, people may become habituated to almost anything.

9) Addiction : Finally the strongest action of a drug is a state in which the altered psychic cannot tolerate the withdrawal of the drug. The drug is essential to the maintenance of ordinary cellular activities. Morphine is a well known drug addiction.

### HOW DRUGS PRODUCE EFFECTS ?

Drugs efficiency is due to the way they react with the cells of the tissues with which they come in contact.

1) The reaction may be chemical, in which case the molecules or ions of the drugs in solution form combination with the albumin or constituents of the cells.

2) The reaction may be physical, as when some of the cell constituents are temporarily dissolved in the drug, to be restored to normal condition again when the drug is eliminated.

3) Many physical changes are due to osmotic pressure changes which alter the water content of the cell.

### DOSAGE OF DRUGS

Dose of a drug is the amount which is given for a therapeutic effect.

The dose can be

- a) Minimal: the smallest amount given which can still have a therapeutic effect.
- b) Maximal: The largest amount of a drug, which produces a therapeutic effect, without giving symptoms of toxicity.
- c) Toxic dose : The amount of a drug which will cause untoward effects ( harmful ).
- d) Lethal dose: the amount of drug which will cause death

The responsibility of dosage of a drug rests on the physician and the patient

should not of his own accord modify the prescription dose, and even worse exchange drugs or medications with another individual suffering the similar disease. If the patient thinks that the drug is not reacting properly, the person should contact the physician as soon as possible, do not delay.

The dose of a drug is based on the age, weight, condition and individuality of the patient. Factors influencing dosage and action of a drug are

- a) the climate
  - b) the nature of the disease
  - c) the weight
  - d) the sex
  - e) temperament and physical condition of the individual
- all these have modifying influences.

The frequency of the dosage is determined by the time of absorption, duration of action and rate of elimination of the drug. Some drugs act quickly and are eliminated rapidly, others tend to cumulate in the body.

#### METHOD OF ADMINISTRATION

The dose of a drug depends in part on the method of administration, a drug given intravenously is acting faster so the dose will be smaller than a drug given orally.

#### THE PRESCRIPTION ( The magic little paper unreadable to anyone.... )

This little paper consists of four parts:

- a) the superscription which includes the name of the patient, the date of the prescription  
the symbol  $\mathcal{R}$  meaning " Take Thou "
- b) The inscription, which gives the names and amount of the ingredients to be used.
- c) The subscription giving the direction to the pharmacist
- d) the signature giving direction to be written on the label

Note: A prescription should not be repeated more than three times without consulting or seeing the physician. It is very advisable not to try to obtain several prescriptions from different doctors, it could be very harmful to your health.

ALUPENT : (Metaproterenol Sulfate / Orciprenaline Sulfate,.)

Is a bronchiodilator- It gives a temporary relief of bronchospasm associated with bronchial asthma, chronic bronchitis, pulmonary emphysema and other pulmonary diseases. Alupent is a potent synthetic sympathomimetic drug.

Route and dosage:

Orally: 20mg / 3 or 4 times daily

Inhalation: ( metered aerosol ): 2 or 3 inhalations or puffs, usually not repeated more often than every 3 to 4 hours. Total daily dose should not exceed 12 puffs ( each puff from a metered inhaler delivers 0.65mg of metaproterenol).

Syrup: each 5ml of clear, sugar free flavored syrup contains orciprenaline sulfate 10mg.

To administer the metered aerosol, first you should shake the container, exhale through the nose as completely as possible, administer puff while inhaling deeply through the mouth, and hold breath a few seconds before exhaling slowly.

The drug will have shorter duration action after long-term use, and patient should report failure to respond to the prescribed dose, do not increase dose or frequency yourself, unless ordered by physician.

Adverse reactions;

Nervousness, weakness, drowsiness, tremor ( specially after oral use, tachycardia, hypertension, palpitation, nausea, vomiting, bad taste, occasional difficulty in micturation and muscle cramps; cardiac arrest if used in excessive doses.

AMINOPHYLLINE :

Smooth-muscle relaxant ( bronchiodilator )

Route and dosage:

Adults: Orally: 100 to 250mg at 6-to 8-hour intervals

Intravenous : ( loading dose in an emergency case ): 5.6mg per Kg over 30 minutes, maintenance dose up to 0.9mg/kg by continuous infusion.

Rectal: suppository or solution: 250 to 500mg 1 to 3 times daily.

Children: 3.5 to 5 mg/kg at 6 -hour intervals.

Adverse reactions

Nausea, vomiting, heavy feeling in the stomach, loss of appetite, bitter aftertaste.

Dizziness, vertigo, headache, lightheaded, nervousness, insomnia, agitation.

Palpitation, tachycardia, flushing, extrasystole

Increase in respiratory rate.

Urticaria

PREDNISONE:

( Adrenocortical steroid/ glucocorticoid )

Prednisone is a synthetic analog of hydrocortisone.

A steroid is a group name given to compounds that resemble the actual human secretion of the adrenal system. Steroids are valuable and useful medications, but, if taken longer than 2 weeks certain side effects may be noticed and the physician should be notified .

Minor side effects:

- 1) Weight gain ( due to water retention )
- 2) Acne
- 3) Headache, fatigue, increased urine frequency

Major side effects:

- 1) Dizziness when rising from a chair or bed, ( postural hypotension indicative of adrenal insufficiency ).
  - 2) Nausea and vomiting
  - 3) Thirst
  - 4) Abdominal pain
  - 5) more severe side effect may occur if medication is taken over a long period of time for a chronic condition
- Feelings of depression  
Nervousness  
Development of an infection

ROUTE & DOSAGE :

The dosage of Corticosteroids is determined by the nature and chronicity of the illness as well as by any other medical problem the patient has. ( Note: Bronchial asthma is a chronic disorder which Prednisone does not cure, however, this drug may be useful when other measures no longer provide adequate control.

Therefore the dose of this drug is highly individualized, as the dose depends on the severity of the disease, the response of the patient, the duration of the disease and the patient's reaction to the medication. Also the age of the patient is a factor to remember , and the sex.

Prednisone should be taken after meals and at bed-time. Alternate day drug administration may be advised to keep the daily dose at the minimal levels and reduce the degree of " Steroid Rebound " with the withdrawal of the drug.

Oral dose :

a) Initial dose: 30 to 60 mg in 24 hours in 2 to 4 divided dose until the desired clinical response is obtained.

b) Gradual dose decrease:

Corticosteroids dosages are reduced gradually to prevent steroid-induced adrenal insufficiency.

( 5 to 10mg ) adjustment every 4 to 5 days to lowest effective maintenance level. Great care should be taken in reducing the steroid dosage.

The reduction in the daily maintenance dosage of steroids should be in steps of 10% at intervals of about one week.

( e. g. : a maintenance dose of 10mg Prednisone per day is reduced to 9mg per day ) The gradual reduction should continue until the patient cannot tolerate a further reduction of the dose , or it is possible to withdraw corticosteroids completely.

When under the treatment of corticosteroids the patient should be closely observed for side effects and discouraged from depending on this potent drug when high doses are not required any longer.

Long term patients should wear a Medic-Tag and have a kit with hydro cortisone in case of a sudden fall in blood pressure ( Hypotension) and shock condition.

\*\*\*\*\*

INTAL : ( Sodium Cromoglycate or Cromolyn Sodium )

Intal is an asthma prophylaxis, it is neither a bronchodilator nor an anti-inflammatory agent. This synthetic drug acts on the mast cells in the lungs and prevent the release of bronchioconstrictors, histamine and slow reacting substances of anaphylaxis .

Pulmonary function test is recommended prior to therapy, the patient should receive detailed instructions for loading the inhaler and administration procedures, the therapeutic effect depends on the proper scheduling and use of the inhaler. Patient should clear out as much mucus as possible before using the inhaler, and make sure not to exhale into the inhaler, because moisture from the breath will interfere with the proper operation.

When an adequate response has been obtained it may be possible to reduce the dose. In severe asthma, particularly in older persons, sodium Cromoglycate therapy alone may be insufficient to control the symptoms.

The action of this drug is preventive treatment, guard off the disease.

The rate of absorption is as follow , about 8% of the dose reaching the lungs is readily absorbed into the systemic circulation. The peak concentration is within 15 minutes half-life, 80 minutes. It is excreted unchanged in bile and urine. Small amounts are exhaled, portions swallowed are excreted in the feces.

#### Adverse Reactions:

Irritated the throat and trachea, cough, hoarseness, nasal congestion, bronchospasm, nausea. Allergic reactions dermatitis, urticaria, and sometimes inflammation of the kidneys.

#### Dosage :

Adults and children 5 years or older. One spinacap cartridge or capsule inhaled 4 times daily using the appropriate inhaler, at 4 to 6 hours intervals. Each capsule contains 20mg of Cromolyn sodium in lactose powder vehicle.

#### Example of dose schedule:

- 1- in the morning on rising
- 1- at noon
- 1- at 6pm
- 1- before going to bed.

VENTOLIN: ( Salbutamol )

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Ventolin is a bronchiodilator.

The dosage of this drug may be adjusted from the initial dose according to the individual response; a fine skeletal muscle tremor may be encountered and caused by a direct skeletal effect.

Oral dose :

The initial dose in adults 2 to 4 mg 3 to 4 times daily , is the optimal initial dose. In elderly people 2mg is the recommended dose. Each pink tablet contains 2mg of Salbutamol.

Inhaler dose:

One to 2 puffs of Salbutamol up to 4 times daily. More than 8 inhalations per day is not recommended. The metered-dose aerosol delivers 100mcg of Ventolin ( Salbutamol with each depression of the valve, and the inhaler contains 200 doses.

Respirator Solution :

This is used only under medical supervision in case of an acute asthma attack. The ventolin respirator is to be given through the IPPV . The inspiration pressure is usually 10 to 20 cm of water ( H<sub>2</sub>O ) and the duration of the administration varies from 5 to 20 minutes. The average dose for an adult and a single treatment is 0.25 to 0.50ml of solution, containing 1.25 to 2.5mg of Salbutamol diluted in 5ml or more of Normal saline or distilled water.

Side effects of the drug:

Oral: Headache, dizziness, palpitations, nervousness and leg cramps may occur.

Inhaler: With frequent use also headache, dizziness, nausea, tremor, palpitation may occur occasionally.

Overdose Symptoms: Aerosol overdose may cause tachycardia, arrhythmia, hypertension and in extreme cases sudden death.

In oral overdose, peripheral vasodilation and increase irritability of the skeletal muscles, tachycardia, arrhythmia, and hypertension may occur, if these symptoms are present gastric lavage may be necessary.

An antagonist drug may be used to counteract the overdose effect, such as Propranolol. During an overdose reaction a reverse effect of the drug can make the patient worse than before taking medication.

\*\*\*\*\*

AMOXIL:

( Antibacterial / Antibiotic. )

Semisynthetic drug, analogue of Ampicillin, used in respiratory tract infections. Is rapidly absorbed following oral administration.

Should be used with caution, it at all in patients with history of Asthma or Allergies .

Dosage & Route :

Oral dose: For adults 250mg to 500mg every 8 hours

Adverse reaction:

As with other penicillins, nausea, vomiting, diarrhea, hypersensitivity reactions, also anemia.

ACTIFED:

Actifed is an Antihistaminic and decongestant drug, with a long acting action and a rapid onset. The maximum effect is in about  $3\frac{1}{2}$  hours and the duration up to 12 hours. It is used in allergic asthma.

Side effects:

Low incidence of drowsiness and mild stimulation

Dosage:

Adult dose: syrup- 10ml daily

tablet- 1 of 2.5mg 2 to 3 times daily

\*\*\*\*\*

ALDACTAZIDE :( Aldactone )

Diuretic- Antihypertensive drug.

This drug is used for the treatment of hypertension, edema, and ascities of congestive heart failure, cirrhosis of the liver. It is a steroidal compound.

Dosage:

Given orally the initial dose is 50 to 100mg daily in divided doses, continued over a period of 2 weeks.

Special precautions

- 1) Maximal diuretic effect may not occur until the 3rd day of therapy and diuresis may continue for 2 or 3 days after the drug is discontinued.
- 2) Patient should be weighed before and after therapy.
- 3) Check blood pressure before, during therapeutic treatment.
- 4) Electrolyte and fluid balance should be checked regularly, patient should report signs of dry mouth, thirst, abdominal cramps, lethargy, drowsiness.

\*\*\*\*\*

AMPICILLIN :

An antibacterial and antibiotic drug.

Ampicillin is a semisynthetic penicillin used in infections of respiratory system, gastrointestinal and other conditions.

When using an antibiotic a careful history should be taken before the therapy begin in order to determine hypersensitivity reactions to penicillin compounds.

Dosage : Adult ( Respiratory infections ) 250mg to 500mg every 6 hours in form of tablets, orally used.

Adverse effects :

Nausea / vomiting / diarrhea / abdominal pain /

Ampicillin maximum absorption is achieved if taken on an empty stomach 1 hour before a meal or 2 hours after a meal, as it is an acid-labile it should not be taken with acidic beverage such as fruit juices or tomatoe juice.

BECLOVENT :

( Inhaler )

An asthma prophylaxis

Beclovent is a potent anti-inflammatory corticosteroid with a strong topical action and a weak systemic activity, when inhaled at therapeutic doses it has a direct effect on the bronchial mucosa.

Dosage: The optimal dosage may vary widely and must be well indicated to each individual. The total dose should not exceed 1mg of Beclomethasone ( 20 puffs ). The usual dose in adults is 2 inhalations ( 2 puffs ) ( 100mdg ) 3 to 4 times daily.

Precautions: The development of pharyngeal and laryngeal candidiasis ( Infection with fungi ) may occur, medication should then be discontinued in order to avoid the fungi to penetrate in the respiratory tract, and treatment with an appropriate antifungal therapy started. To minimize this incidence the patient should rinse their mouth with water after each inhalation.

No adverse major effects are attributed to the use of this drug if used in the right manner.

\*\*\*\*\*

BEROTEC:

( Inhaler )

(Fenoterol Aerosol )

It is a bronchodilator acting on the bronchial smooth muscles.

Fenoterol increase the pulmonary function 5 minutes after the administration, and a maximal effect is obtained in 30 to 60 minutes. The relief effect remains the same for 2 to 3 hours before actually declining.

Indications: Bronchial asthma

Contraindication: Tachycardia, Fenoterol should be used with care in asthmatic or emphysematous patients who have systemic hypertension, coronary artery disease, congestive heart failure, diabetes mellitus, hyperthyroidism, glaucoma.

Adverse Effects:

Tremor/ palpitations / dizziness/ headache/ nausea/ lightheaded/ and weakness. Sometimes vomiting / heartburn / sweating / bad taste / fatigue/ prickling and tingling sensations over body / and agitation .

Dosage: A single dose for adult 1 or 2 inhalations ( 0.2 to 0.4mg ) to control bronchospasms. If required the dose may be repeated up to 4 times daily. Patient should not exceed 8 inhalations per day and not be taken more often than every 4 hours. When the medication is not acting as a therapeutic, the physician should be contacted.

\*\*\*\*\*

BECONASE: ( Beclomethasone -Dipropionate. )

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Nasal spray/ Allergic Rhinitis therapy

Beconase is used for the treatment of perennial and seasonal allergic rhinitis unresponsive to conventional treatment.

Occasional sneezing attacks have followed immediately after the use of the intranasal aerosol, some people complain of burning sensation and irritation in the nose.

Precautions as with the use of the Beclovent inhaler fungi infection may develop in the pharyngeal area.

Dosage : In adult the usual dose is 1 puff into each nostril 3 to 4 times per day, each metered dose aerosol container delivers 50mcg of Beclomethasone with each depression of the valve. Above 1mg ( 20 puffs ) can be dangerous, such as adrenal suppressive effects.

\*\*\*\*\*

BRICANYL ( Terbutaline Sulfate )

Bronchiodilator / tablets

Terbutaline produces bronchiodilation of the bronchial smooth muscles, causing relaxation of the muscle fibres. This action brings an increase in the force expiratory volume when measurements are done. An improvement in the pulmonary function occurs 60 to 120 minutes after an oral dose of Bricanyl. The bronchiodilator activity can last from 4 to 8 hours.

Adverse effects: Adverse effects include nervousness/ tremor and sometimes headache/ increased heart rate/ palpitations / ectopic beats of the heart/ drowsiness/ nausea/ vomiting / sweating / dizziness .

Dosage : The usual adult dose orally 5mg every 6 hours in intervals , 3 times daily during the hours that the patient is usually awake. A total dose of 15mg should not be exceeded in a 24 hour period.

\*\*\*\*\*

BACTRIM: ( Trimethoprim-Sulfamethoxazole )

Antibacterial

This is used in chronic lower respiratory tract infection, unresponsive to Ampicillin or Tetracycline.

Adverse effects: Diarrhea/ constipation / headache / anorexia / gastritis / and liver changes. Troubles with the vision can also occur, drug fever, and changes with the blood.

Dosage : Adult dose

Minimal dose .1 to  $\frac{1}{2}$  tablet twice daily ; each capsule contains Trimethoprim 80mg- Sulfamethoxazole 400mg - adult capsule .

\*\*\*\*\*

BENADRYL: ( Diphenhydramine HCL )

Antihistamine

Antiallergic drug used in allergic diseases such as hay fever, allergic rhinitis, urticaria, bronchial asthma, etc.....

Since the depressant effects of the antihistamines are additive to other drugs affecting the central nervous system, patients should be cautioned against drinking alcoholic beverages or taking hypnotics and sedatives.

Side effects: Drowsiness / dizziness / dryness of the mouth / nausea and nervousness may occur. Other infrequent effects may occur such as vertigo / palpitation / blurring vision/ headache / restlessness / insomnia. One very important side effect thickening of bronchial secretion.

Dosage: oral dose : average for adults 25mg to 50mg 3 to 4 times daily.

\*\*\*\*\*

CORTISONE ACETATE

Cortisone is a natural product of the adrenal cortex of the adrenal gland. Cortisone acetate is a short acting synthetic adrenocortical steroid. It is used to control severe allergic states which do not respond to conventional treatment, also used for bronchial asthma, bronchospasm, pulmonary emphysema.

Adverse effects: Fluid and electrolyte disturbances / fluid retention / congestive heart failure / potassium loss / muscle weakness / convulsions / increased intracranial pressure .

Dosage: In adults the initial dose 25 to 50 mg daily.

\*\*\*\*\*

CHOLEDYL: ( Gtriphylline )

Bronchiodilator

It is used to relieve bronchospasm in chronic bronchitis, bronchial asthma, pulmonary emphysema and obstructive lung diseases.

Adverse effects:

Gastric distress / sometimes palpitation and irritability due to stimulation of the central nervous system/ restlessness/ nervousness/ insomnia.

Dosage : Adult optimal starting dose is 200mg to 400mg 3 to 4 times a day. Dose should be adjusted according the patient's response, there is also a Cholelyl expectorant Elixir used as expectorant and bronchiodilator.

\*\*\*\*\*

DIPHENHYDRAMINE:

Antihistamine

This drug has an antispasmodic activity. It is used for symptomatic relief of various allergic conditions and to treat or prevent motion sickness.

Cautions : use with precautions if there is an history of asthma, convulsive disorders, hypertension, cardiovascular disease, diabetes mellitus.

Adverse effects : Drowsiness / dizziness/ vertigo/ fatigue / tingling/ weakness of hands/ tremors/ restlessness /insomnia/ nausea/ vomiting/ constipation/ diarrhea .

Dosage: adult dose 25mg to 50mg 3 to 4 times daily. Maximum daily dosage 400mg.

DELTASONE: ( Prednisone tablet )

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Corticosteroid

Prednisone is about 5 times more potent on a weight basis than cortisol in glucocorticoid and anti-inflammatory activity.

It is used in respiratory diseases, pulmonary emphysema where bronchospasm or bronchial edema plays a significant role.

Corticosteroids therapy may mask signs of infection, and new infections may appear during their use. There may be a decreased resistance and inability to localize infection when corticosteroids are used.

Adverse effects: are numerous and can effect the gastrointestinal system, may effect the skin, which becomes fragile and thin. Increased sweating. Effects also the endocrine system.

Dosage: This is very individualized according to the severity of the disease and the response of the patient, in chronic conditions requiring long term of therapy, lowest dosage should be used. In tablet form 10mg to 30mg daily divided into 4 doses can be used at the initial dose for adults. Gradually the dose should be decreased until a control of the disease is established.

\*\*\*\*\*

ERYTHROMYCIN:

Antibacterial

This drug is used in primary atypical pneumonia, acute pelvic inflammatory diseases, infections caused by staphylococci and streptococci.

In the treatment of diphtheria as an adjunct to antitoxin.

Treatment of primary syphilis in patient allergic to penicillin.

Adverse effects: Abdominal cramping/ distention/ diarrhea / infrequently nausea/ vomiting / heartburn / anorexia.

Dosage: oral dose for adults 250mg every 6 hours. The activity of erythromycin may be decreased in an acid medium and by the presence of food in the stomach, therefore should be taken preferably on an empty stomach 1 hour before meals or 3 hours after meals. do not take with or after fruit juices.

\*\*\*\*\*

ETRAFON D: ( Amitriptyline )

Antidepressant / antipsychotic / antianxiety .

This drug is used for the treatment of patients with anxious or agitated depression.

Note: where patients are participating in activities requiring mental alertness such as driving or operating a machine, Etrafon should be given with caution and the patient should be warned of the danger.

Adverse effects: are numerous, the most important ones are hypotension / tachycardia / drowsiness / excitement/ insomnia / bizarre dreams/ dizziness.

Dosage: For adult 1 tablet Etrafon D ( 2-25) 3 to 4 times daily. depending on the severity of the agitation and the anxiety.

EPINEPHRENE: ( Adrenaline BP)

Sympathomimetic - Epinephrine is an active principal of the adrenal medulla.

It is used for temporary relief from acute paroxysms of bronchial asthma.

palpitation. { Adverse effects: minor effect of anxiety/ headache /fear/

Dosage: Intramuscular & subcutaneously for bronchial asthma and certain allergic manifestation- 0.2ml of Epinephrine.

Inhalation: Treatment should be started at the first sign of wheezing or shortness of breath due to bronchospasm. 1 or 2 puffs each time, do not exceed 8 times.

\*\*\*\*\*

ISUPREL : ( Isoproterenol- Benylephrine HCL )

Sympathomimetic

Ne<sup>o</sup>-mistometer Isuprel, used to relieve symptoms of bronchospasms in bronchial asthma, chronic bronchitis, and emphysema. Do not use this drug at the same time as Epinephrine.

Adverse effects: Tachycardia/ palpitation/ nervousness/ nausea/ vomiting may occur.

Dosage: A single dose inhalation will generally control an acute attack- if a second dose is required a full minute should elapse before repeating the inhalation. Not more than 8 treatments in 24 hours should be taken. Each metered dose delivers 160mcg of active ingredients in a fine, even mist of optimal droplet size for inhalation.

When using the mistometer unit close lips and teeth around open end of mouth piece; breathe out, expelling as much air as possible from the lungs, then inhale deeply while pressing down on the bottle which is in an inverted position, to activate spray mechanism. Try to hold breath for a few seconds before exhaling-wait one full minute before you repeat the dose.

\*\*\*\*\*

MEDIHALER -EPI: ( Epinephrine Bitartrate )

Bronchodilator

This is used for temporary relief from acute paroxysms of bronchial asthma.

Adverse effects: Excessive dosage of Epinephrine may cause bronchial edema and inflammation / palpitation / anginal pain / tremor / nervousness / restlessness/ sleeplessness / dizziness / headache / nausea / sweating .

Dosage: for adults 1 or 2 inhalations 4 to 6 times daily. do not exceed 12 inhalations per day.

\*\*\*\*\*

NOVOTETRA : ( Tetracycline HCL )

Antibiotic

Chemotherapy should not be initiated until all the necessary bacteriological investigations have been started, it is used to treat many strains of bacterial infections.

Novotetra : Cont'd

Adverse effects: anorexia / epigastric pains / vomiting / diarrhea / sore throat / skin reactions / anemia.

Dosage: Adults- 250mg 4 times daily. Oral dose should be taken 1 hour before meals or 2 hours after meals.

\*\*\*\*\*

QUADRINAL ( Ephedrine- K1-Theophylline compound )

Bronchodilator-Expectorant

This drug is used in chronic respiratory disease with tenacious mucus and bronchospasm are dominant symptoms such as bronchial asthma, chronic bronchitis, pulmonary emphysema.

Precautions : Patients starting Quadrinal therapy should be carefully observed to determine if the dose prescribed is suitable; when using the compound mixture of high doses aerosol to control the symptoms of the disease, excessive stimulation of the central nervous system may occur from the ephedrine. It may in some instances be wiser for the patient to use the drug in separate single dose. Alcohol should not be taken at the same time.

Adverse effects: gastric irritation / vomiting / mild sore throat / Slight rhinitis may occur.

Dosage: Adult, one tablet oral, or 10ml of the suspension 3 to 4 times daily.

Each tablet contains:

Ephedrine: 24mg

Phenobarbital : 24mg

Theophylline: 130mg

Potassium iodide : 320mg

Suspension : each 5ml of suspension contains

Ephedrine: 12 mg

Phenobarbital : 12mg

Theophylline : 65mg

Potassium iodide: 160mg

Cautions with patients sensitive to iodides, in the presence of diabetes mellitus, cardio vascular disease, hyperthyroidism, hypertension. Quadrinal iodides should never be used as expectorants during adolescence because of their potential to induce exacerbate acne and adverse effect on the thyroid.

Also as it contains a barbiturate preparation it may impair mental and physical abilities and potential hazardous tasks such as driving a vehicle or operating a machine should be avoided.

\*\*\*\*\*

RYNACROM : ( Sodium Cromoglycate )

For insufflation

Insufflation : is the act of blowing a powder, vapor, gas, or air into a cavity, as into the lungs.

This drug is used for seasonal rhinitis prophylaxis.

Adverse effects: Occasionally slight irritation of the nose when using insufflation of the powder / redness of the skin / urticaria / sometimes headache / sneezing / cough/ and unpleasant taste in the mouth.

Rynacrom (Cont'd):

Dosage: Initial treatment for adult one cartridge to each nostril 4 times daily at 4 to 6 hours intervals. When adequate response to the drug is obtained, the dose may be reduced to one cartridge to each nostril every 8 to 12 hours.

Withdrawal of medication should be done gradually over a period of one week. Symptoms of rhinitis may recur when Rynacrom is discontinued. The drug is supplied in a single dose cartridge which is administered by a special developed insufflator. A demonstration of the use of the insufflator should be done before the patient uses Rynacrom.

\*\*\*\*\*

HYDROCHLOROTHIAZIDE:

Diuretic- Antihypertensive drug

This drug has properties as a diuretic as well as an antihypertensive, it may be used for this purpose either alone or to enhance the antihypertensive action of other drugs.

It is used for edema associated with congestive heart failure, hepatic cirrhosis, corticosteroids and estrogen therapy.

Precautions: The possibility of sensitivity reactions should be considered in patients with or without a history of allergy or bronchial asthma.

Adverse effects: Anorexia / gastric irritation / nausea / vomiting / cramping / diarrhea / constipation / jaundice / pancreatitis / dizziness / vertigo / headache / rash / urticaria / pneumonitis / muscle spasm / weakness / restlessness / hyperglycemia .

Dosage: Initial dose for adults orally is 25mg to 200mg per day. the average maintenance dose is 75mg to 100mg daily.

\*\*\*\*\*

SERAX: ( Oxazepam )

Antianxiety agent

This tablet form drug is used for short term management of anxiety / tension / agitation / irritability / insomnia / psychophysiological reaction / geriatric behavioral disturbances / anxiety syndrome in alcoholics and alcohol withdrawal.

Adverse effects: Mild drowsiness / dizziness / vertigo / headache / sometimes syncope if the drug is taken over a long period of time / skin rashes / tremor. Oxazepam should not be prescribed in excess of 6 weeks without follow up and establishing the need for more prolonged administration of the medication.

Dosage: Mild dose 10 to 15 mg 3 to 4 times daily . For severe anxiety 15 to 30mg 3 to 4 times daily.

\*\*\*\*\*

SLOW K -600 ( 8mEq )

Potassium replacement therapy

Potassium supplement is either for prophylactic or therapeutic purposes. It is used as a supplement with patients under diuretic or corticosteroid therapy, patients receiving Digitalis, ( a lack of potassium sensitizes the myocardium to the toxic action of digitalis. )

MSB9

Slow K -600 cont'd:

Adverse effects: small bowel ulceration has been very rarely reported / abdominal pain / distention / nausea/ vomiting / gastro intestinal bleeding may also occur.

Dosage: Must be individualized according the patient's needs, and preferably taken after meals. The tablet Slow-K 600mg ( 8mEq) of potassium is in a slow release wax core. Two to 6 Slow K is an average daily dose, or can be given on alternate days, it will provide adequate potassium supplement in most cases.

\*\*\*\*\*

TETRACYN : ( Tetracycline )

Antibiotic

Before Tetracyn is used culture and sensitivity testing are advised to determine the susceptibility of the infection organisms to Tetracycline. Tetracyclines are indicated in infections caused by micro-organisms such as Mountain spotted fever / typhus fever / Rickettsiae / anaerobic streptococci / streptococcus / for upper respiratory infections due to group A streptococci.

Precautions: During long term use of the Tetracyclines, this drug may cause permanent tooth discoloration ( yellow-grey-brown ) during tooth development and during the last half of pregnancy, infancy and childhood) Tetracycline form a stable calcium complex in any bone forming tissue.

Adverse effects: Anorexia / epigastric distress / nausea / vomiting / diarrhea / stomatitis / sore throat / glossitis / black hairy tongue / hoarseness / skin rashes / anemia.

Dosage : Oral dose for adults: 250mg 4 times daily is an average dose.

Antiacids containing aluminium, calcium or magnesium and iron salts impair the absorption of oral Tetracyns, also some foods and daily products interfere with the absorption.

Oral Tetracyn should be taken 1 hour before meals, or 2 hours after meals.

Intramuscular route: Tetracyn is diluted with water for injection. adult dose 200mg to 300mg daily

Intravenous route: The injection must be given slowly. An average dose 500mg every 12 hours.

\*\*\*\*\*

TEDRAL: ( Theophylline/ Ephedrine / Phenobarbital )

Antiasthmatic

This drug is used for the symptomatic relief of bronchial asthma, asthmatic bronchitis, and bronchospastic disorders. May be used as a prophylactic to minimize asthmatic attacks including the allergic forms . Being a "Cocktail " mixture , 3 drugs, Tedral should be used only with patients whom the ratio of Theophylline to Ephedrine present in the aerosol is found satisfactory.

Precautions: as it is a fixed-dose combination, patients starting Tedral therapy should be carefully observed to determine the effects.

Tedral Cont'd:

Adverse effects: Stimulation of the central nervous system. from the Ephedrine. As the drug contains also a Barbiturate ( Phenobarbital ) it may impair mental and physical abilities, and for the performance of potentially hazardous tasks such as driving a vehicle or machinery, it is not wise to perform such jobs.

Dosage: Elixir: adult dose 15 to 30 ml, 4 times daily

Tablets: adult dose: 1 or 2 tablets 4 times daily.

Each 15ml of sugar-free Elixir contains

Theophylline: 97.5mg  
Ephedrine: 18mg  
Phenobarbital: 6mg  
Sodium: 3.6mg  
11% alcohol by volume  
Caloric content 21.8 cal

Each tablet contains

Theophylline: 130mg  
Ephedrine: 24mg  
Phenobarbital: 8mg  
Caloric content: 0.8 cal

\*\*\*\*\*

TETREX: ( Tetracycline Phosphate complex )

Antibiotic

Tetracyclines are given in infections caused by micro-organisms.

Adverse Effects: Anorexia / epigastric distress / nausea / vomiting / diarrhea / bulky loose stools / stomatitis / sore throat / glossitis / hoarseness / and skin rashes.

Dosage: Adults should receive an average oral dose of 250mg 4 times daily. Fats and some dairy products interfere with the absorption of oral Tetracycline, it should be given 1 hour before meals or 2 hours after meals.

\*\*\*\*\*

TUSSIONEX : ( Resin complexes of Hydrocodone and Phenyltoloxamine )

Antitussive

This drug is used to control dry, unproductive cough and cough associated with respiratory infections.

Before taking medications to suppress or modify cough, it is very important to identify the cause of the cough, as modification of the cough could increase the risk of the clinical or physiological complications.

Do not alter the composition of the suspension by adding such expectorant agents as potassium iodide and ammonium chloride.

Note: Tussionex contains Hydrocodone which may be habit-forming.

This drug should not be taken at the same time as alcoholic beverages, or taking hypnotics, or sedatives. Patients should be cautioned not to operate vehicles or hazardous machinery until their response to the drug has been determined.

MSB4

Tussionex Cont'd :

Adverse effects: Mild constipation / nausea / drowsiness.

Dosage: Adult dose oral : 1 tablet or 5ml suspension every 8 to 12 hours.

Each tablet contains or every 5ml of liquid contains

Hydrocodone: 5mg

Phenyltoloxamine :10mg

Cation exchange resin: 42mg

Caloric content : suspension - 3.98 calories

tablet: 1.23calories

Sodium content : 0.4mg per 5ml of suspension or 1 tablet

\*\*\*\*\*

VANCERIL INHALER : ( Beclomethasone Dipropionate aerosol )

Asthma prophylaxis

Beclomethasone dipropionate is a potent anti-inflammatory steroid with a strong topical and weak systemic activity. It is used in the treatment of corticosteroid responsive asthma.

1) In asthmatic patients who do not respond adequately to conventional therapy

2) In corticosteroid-dependent asthmatics where reduction of systemic corticosteroids is desirable.

Adverse effects: No major adverse effects if the recommended dose is used.

Dosage: Maximum daily dose for adults should not exceed 20 inhalations or 1mg of Beclomethasone dipropionate. The usual maintenance dose is 2 inhalations ( 50 mcg ) 3 to 4 times per day!

In the presence of excess mucus secretion, severe attacks of asthma or infection, the drug may fail to reach the bronchiole, if this is the case medication should be changed to a short course of systemic corticosteroids.

MSB4

## APPENDIX G

HUMAN BODY PROGRAM MANUAL

The Human Body, this marvellous combination of mechanical and voluntary moving parts, is the most intricate instrument, and a very difficult one to repair.

The body is made up of many tissues and organs, each having a specific function to perform.

## THE CELL

The cell is the smallest element of the body. The cells are made of proteins, fats, sugars and starches, minerals and vitamins that come from the food we eat.

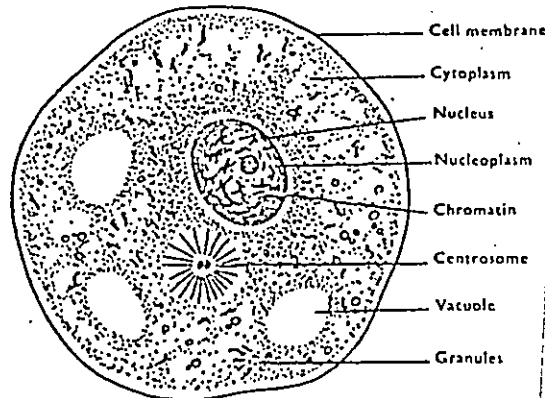


FIG. 1  
A simple cell

The cell is a minute ( jelly-like ) mass of protoplasm containing a nucleus held together by a cell membrane. Cells have the properties of all living matter

Ingestion, assimilation, growth and repair, metabolism, respiration, excretion, preservation, reproduction, conductivity, irritability.

Cells require body fluid to survive, this fluid is partly inside and partly outside the cells.

Intracellular fluid forms 50% of the body weight, it lies within the cells, it contains electrolytes such as potassium and phosphates, and food materials like glucose and amino-acids. The enzyme action is constant within the cells breaking down and building up to maintain the balance of the metabolism.

\*Enzyme\* is a chemical substance which produces or speeds up chemical changes in other substances without being changed itself.

Extracellular fluid or interstitial, represents 30% of the water of the body ( 12 litres ). This is the medium in which the cells live, obtaining salts, food, oxygen, and passing their waste products into the extracellular fluid.

Blood plasma forms 5% of the body weight, ( about 3 litres ) it is the transport system which serves the cells through the medium of extracellular fluid.

Our body develops from a single initial cell which is formed by the fusion and fertilisation of the female germ cell ( ovum ) by the male germ cell ( the spermatozoon ). This initial cell is called ( Zygote )

The zygote grows and reproduces forming millions of cells which arrange themselves into tissue. The tissues in turn arrange themselves into organs which form our body.

### TISSUE

A tissue is a group of cells that are similar in structure and function. There are four groups of tissues in the body.

EPITHELIAL  
CONNECTIVE  
MUSCULAR  
NERVOUS

These four fundamental groups make up the body as a whole.

### EPITHELIAL

The epithelial tissue consists of three varieties of cells

Squamous ( found in the alveoli of the lungs, lining of the heart, lining of blood vessels, and lymphatic vessels. )

Columnar ( found in cells of the intestines, lines ducts of most glands in the body, the gall-bladder : )

Ciliated ( found in air passages \* , uterine tubes, ventricles of the brain. )

NOTE: In the respiratory passages the constant movement of the processes called CILIA prevents dust, mucus, to enter the lungs. Goblet cells are mucus-secreting cells which lie in the walls of glands. Goblet cells secrete mucus or MUCIN and express it on to the surface as in the stomach, colon, and trachea. Mucus consists of water, salt and protein (Mucin ) which gives the sticky or viscid character to the secretion.

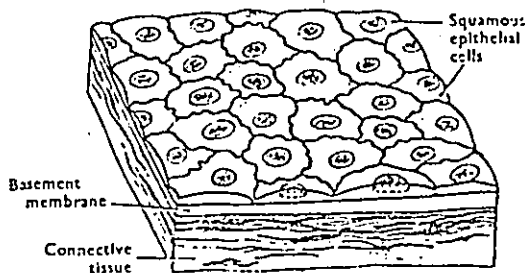


FIG. 3  
Squamous epithelium

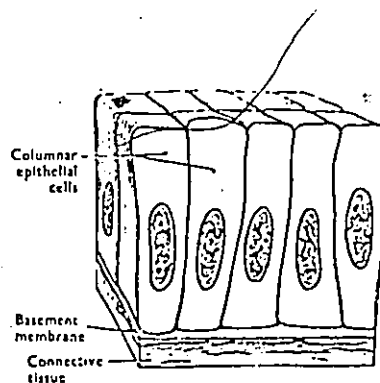


FIG. 5  
Columnar epithelium

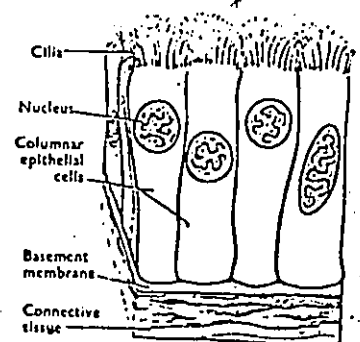


FIG. 6  
Ciliated epithelium

## CONNECTIVE

The connective tissues are often describe as supporting tissues of the body, the main function bein mechanical connectin. Connective tissue provides the framework of the body. There are several varieties of connective tissues

AREOLAR  
ELASTIC FIBRES  
FIBROUS TISSUE  
LYMPHOID TISSUE  
ADIPOSE TISSUE

Areolar It is found in almost every part of the body, connectin and supporting organs.

Example:

- 1) under the skin, allowing for pliability
- 2) between muslces and supporting blood vessels and nerves
- 3) lining the digestive tract ( submucous coat )
- 4) in the interior of organs binding together their main struc-  
ture.

Elastic fibres elastic tissue is capable of considerable extension and recoil. It is found in organs where alteration of shape is required.

Example:

- 1) in arteries, especially the large arteries
- 2) in the trachea and bronchi
- 3) in the lungs

Fibrous tissue white fibrous tissue is a strong connective tissue , it forms

- 1) the ligaments binding bones together
- 2) it forms the outer protective covering of bone , periosteum.
- 3) it forms the outer protective coverinf of some organs, kidneys lymphatic glands, blood vessels, and brain.
- 4) it forms the sheaths for muscles which is know as "muscle fascia ".

Lymphoid tissue the lymphoid tissue is made of special cells called ( lymphocytes ) . This tissue is found

- 1) lymphatic nodes
- 2) spleen
- 3) Tonsils and adenoids
- 4) the appendix and some glands in the small intestines

Adipose tissue known as fat cells. Fatty or adipose tissue is found supporting organs such as the kidneys and the eyes. It is found between the bundles of muscle fibres and mixed with areolar tissue under the skin giving the body a smooth continuous outline.

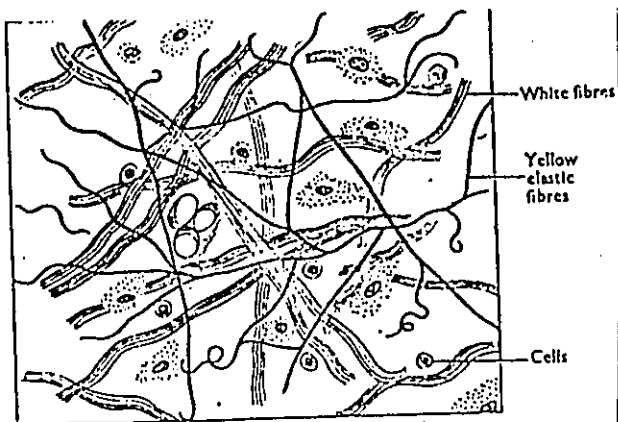


FIG. 9  
Areolar tissue

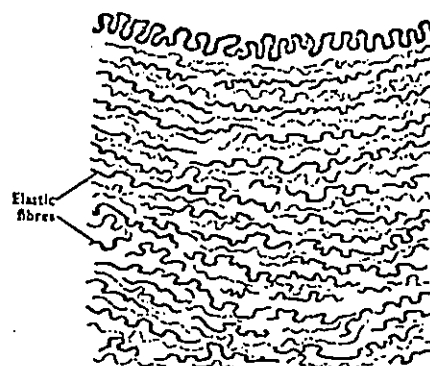


FIG. 12  
Yellow elastic tissue



FIG. 11  
White fibrous tissue

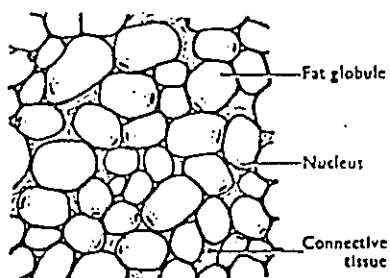


FIG. 10  
Fatty or Adipose tissue

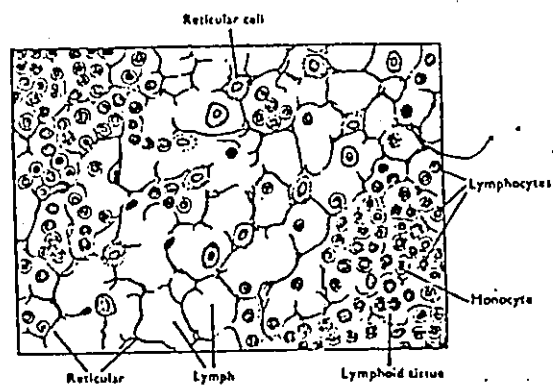


FIG. 13  
Lymphoid tissue

Cartilage or gristle is a much firmer tissue than any connective tissue, it is a dense clear blue- white substance very thin. It is located at joints and between bones. Cartilage does not contain blood vessels, but is covered by a membrane "the perichondrium" from which it derives its blood supply.

There are three types of cartilages

Hyaline cartilage, smooth in appearance, it is found in

- 1) part of the larynx, trachea, bronchi
- 2) costal cartilages which attach the ribs to the sternum
- 3) articular surfaces of bones

Fibro cartilage dense white fibres, fibro cartilage is found  
1) between the bodies of the vertebrae, called inter-vertebral discs.

2) between the articulating surfaces, knee joints, called also semi-lunar cartilages.

Elastic cartilage it is a firm elastic cartilage due to a yellow elastic fibres running through the cells. It is found in the lobe of the ears, the epiglottis.

BLOOD This is a connective tissue. Blood is the means of transport for the requirements of every cell and tissue, no cell will live unless it receives nutritive material, hormones, enzymes and oxygen. Blood is a fluid tissue composed of two parts

Plasma, the intercellular substance constitutes approximately 55 per cent, a little over half the volume is fluid, it is faintly yellow transparent in color, it is composed of water 90 to 92 %, plasma proteins 7%, inorganic salts, organic substances, organic waste products, hormones, enzymes, antibodies, gases.

Blood cells, corpuscles are present in blood, there are three varieties, red blood cells ( erythrocytes ) white blood cells ( leucocytes ) blood platelets ( thrombocytes ) these blood cells form 45 % of the remaining volume. This percentage is described as the Haematocrit or packed cell volume ranging from 40 to 47. The volume of the blood is constant in a healthy person, it is regulated to a great extent by the osmotic pressure in the vessels and in the tissues.

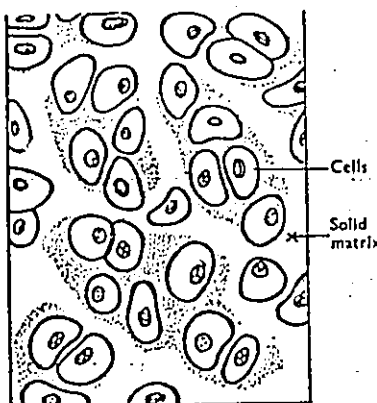


FIG. 14  
Hyaline cartilage

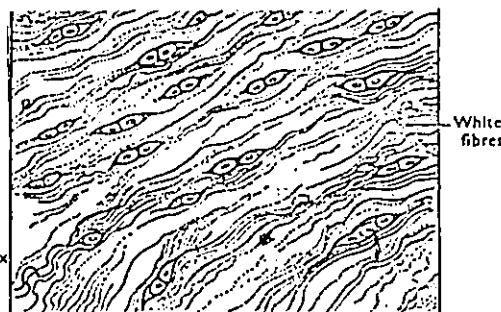


FIG. 15  
White fibro-cartilage

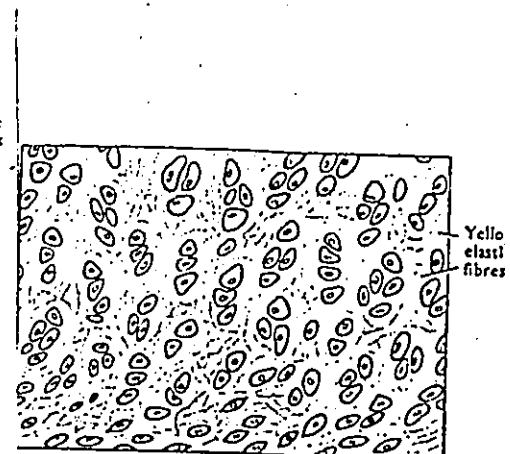


FIG. 16  
Yellow elastic cartilage

## MUSCULAR TISSUE

Muscle is a tissue which specialized in contraction. Muscles are attached to bone, cartilage, ligaments and to the skin. The muscles placed immediatly under the skin are flat, the muscles which surround the trunk are broad and flat, the muscles around the limbs are long. The skeletal muscles do not act individually but in groups to perform movements of the different parts of the skeleton. Each group opposes another and is called its "Antagonist". Flexor muscles are antagonists to the extensor muscles.

There are three main types of muscle tissue

VOLUNTARY MUSCLE

INVOLUNTARY MUSCLE

CARDIAC MUSCLE

VOLUNTARY MUSCLE or skeletal muscles is striated or striped.

It is a voluntary muscle because it is under the control of the will. Most voluntary muscles are attached either to bone or skin by fibrous tissue known as "muscle tendon" which is a prolongation of the muscle fascia.

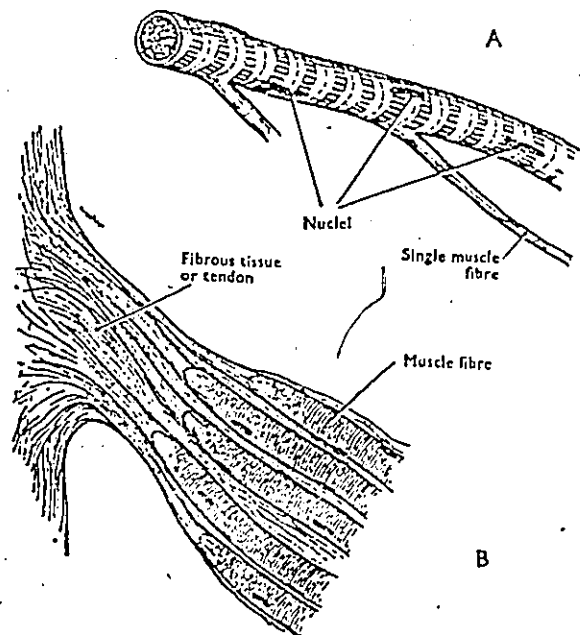


FIG. 21

(A) Diagram of a group of muscle fibres  
(B) Diagram of a muscle and its tendon

UNVOLUNTARY MUSCLE or smooth, plain or visceral muscle. It is not under the control of the will. Unvoluntary muscle is found in the wall of blood vessels and lymphatic vessels, the wall of the alimentary canal and respiratory tract, in the urinary bladder and uterus.

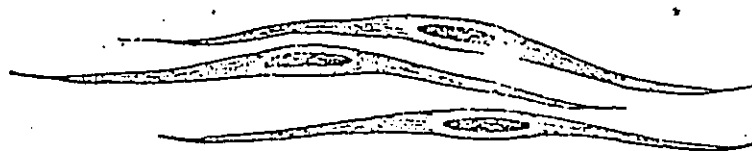


FIG. 22  
Involuntary tissue

CARDIAC MUSCLE it is exclusively found in the structure of the heart.

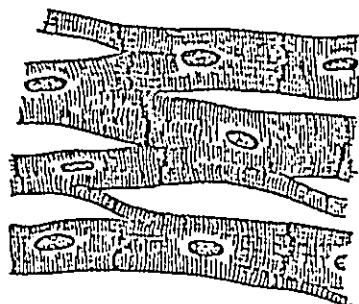


FIG. 23  
Cardiac muscle

Its fibres branch and anastomose with each other, they are red in color and not controlled by the will. The cardiac muscle possesses the special property of "automatic rhythmic contraction" independent of its nerve supply. The cardiac muscle contracts rhythmically at an average of 72 times per minutes.

The heart is a hollow muscular organ, cone shaped, it lies in the thoracic cavity between the lungs, it lies obliquely, a little more to the left than the right. It presents a base and an apex. The heart is approximately four inches in length ( 10cm ) it weighs approximately nine ounces ( 270 gm ) it is about the size of the owner's fist.

NOTE: During exercises muscle fibres shorten when the muscle contracts, to produce this change energy is necessary. This energy is derived from carbohydrate which is taken into the body in the diet and from oxygen which is taken from the air inhaled in the lungs. During the muscle fibre contraction chemical changes take place, and to produce this change energy is necessary. A proportion of the carbohydrate which is ingested and absorbed in the body is stored in the muscles as "glycogen". After a muscle has contracted "Lactic acid" is found to be present in the muscle fibre. The oxygen brought to the muscle by the blood is necessary for oxidation of some of the lactic acid to carbon dioxide and water, the rest is changed back to glycogen, the carbon dioxide and water are taken by the blood as waste products. Carbon dioxide is exhaled by the lungs and water is known as "water metabolism" which augments the water already present in the body. If the collection of lactic acid in the muscle is excessive, the proper oxidation cannot keep pace, pain will result.

## NERVOUS TISSUE

The nervous tissue consists of three kinds of matter

- 1) Grey matter forming the nerve cells
- 2) White matter forming the nerve fibres
- 3) Neuraglia, special kind of supporting cell, found only in the nervous system, holding together and supporting nerve cells and fibres. Each nerve cell with its processes is called NEURONE.

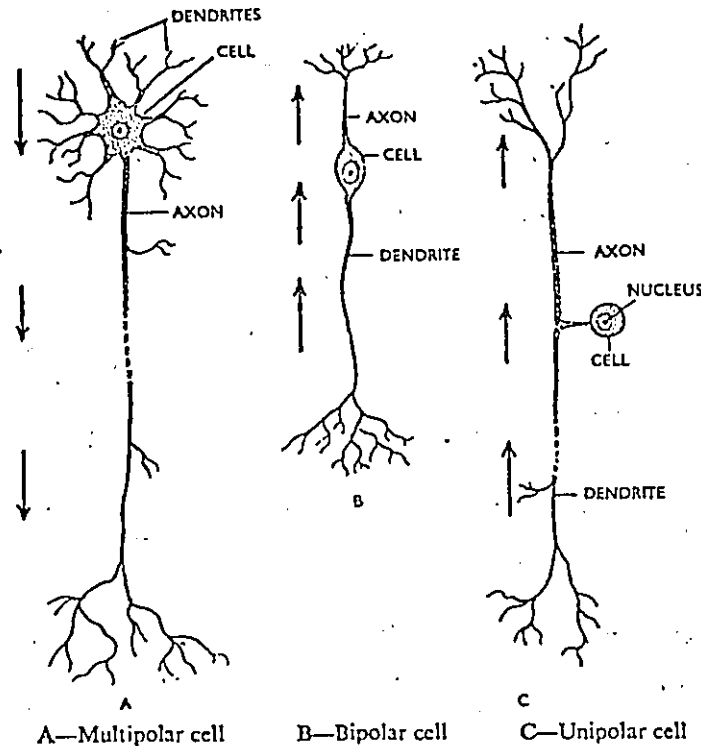


Diagram indicating different types of nerve cells

Nerve tissue has the characteristics of Irritability and conductivity. Irritability means the power to respond to stimulation, conductivity means the ability to transmit an impulse. The types of stimulation which will cause activity in the nervous system include: pain, temperature, pressure and touch. The speed at which a nerve impulse travels along a nerve fibre differs and may be as much as 120 metres per second or 270 miles per hour.

THE NERVOUS SYSTEM

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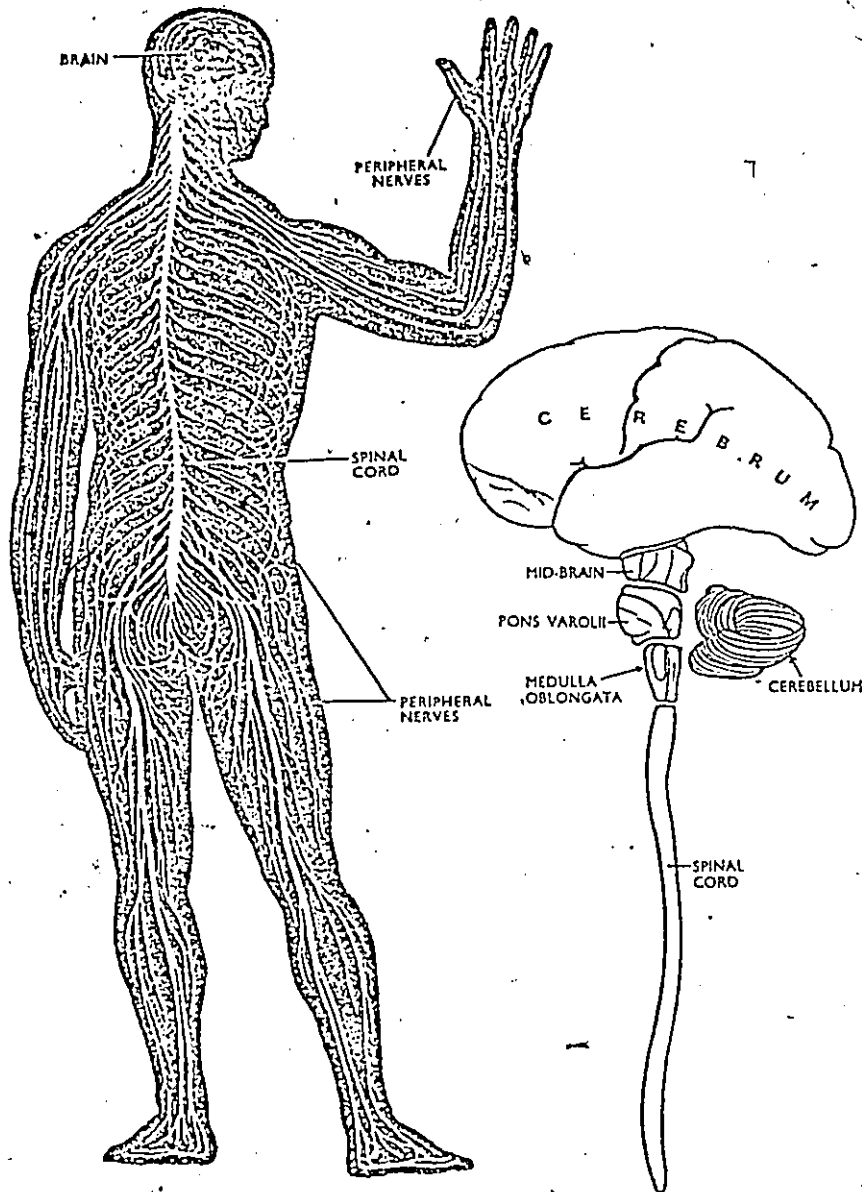


FIG. 240

General view of the brain, spinal cord and spinal nerves

FIG. 241

General view of the different parts of the brain and spinal cord

## BONE

Bone is one of the hardest connective tissue in the body. It is composed of :

- Water 25%
- Organic materials 30%
- Inorganic salts 40%

Bone consists of two kinds of tissues

Compact tissue

Cancellous tissue

Compact bone tissue, is hard and dense, it is found in flat bones and in the shafts of long bones and as a thin covering over all the bones.

Cancellous bone tissue is spongy in structure, it is found principally in the ends of the long bones, in the short bone it is situated as a layer in between tow layers of compact tissue such as in the sternum, scapula, ribs, cranium.

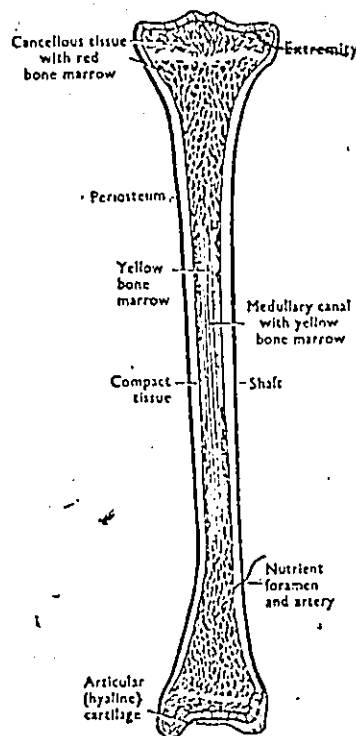


FIG. 18

Diagram of the naked-eye structure of a long bone, longitudinal section

Bones are lightweight, they make up about one fifth of the total body, if a person weighs 80 lbs or 36 kg, the weight of the bones will be 16 lbs or 7 kg.

The skeleton gives the shape and support of the body, it serves as a protective case for some of the more delicate organs such as the brain and the heart.

The skeleton is made up of 206 bones which are joined to one another by band of tissue called "ligaments". The 206 bones of the body are divided as follow!

22 bones are in the skull, including the face and the head, 14 bones are in the face, 8 bones in the head, the 8 bones of the head are joined permanently. The tip of the nose is made of cartilage, a flexible tissue.

NOTE: the smallest bone in the body are inside the ear, 3 bones called : hammer, anvil; stirrup.

There are 27 bones in each hand, and 26 bones in each foot. The femur , or thighbone is the longest bone in the body. If a person measures 4 feet ( 1.2metres ) the thighbone will measure 14 incjes ( 35 cms)

The inside of the bone is spongy, this soft tissue is called "bone marrow ", the red bone marrow helps with the formation of red blood cells, the yellow bone marrow stores fats and minerals, being a storage place.

The human body has 32 teeth, they are made of enamel on the outside and a soft tissue inside "Dentin " and a very soft centre called " pulp".

FIG. 182  
Position of the  
teeth, side view

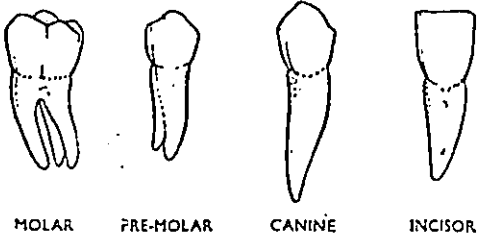
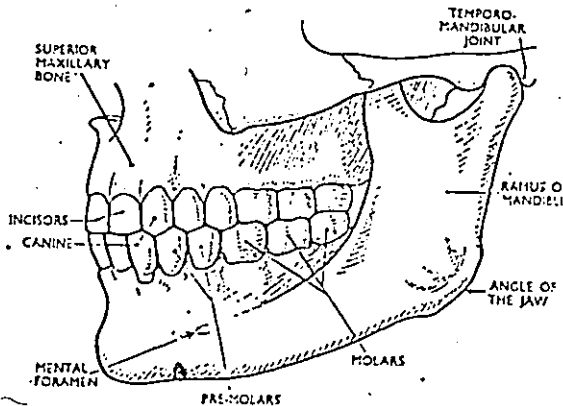
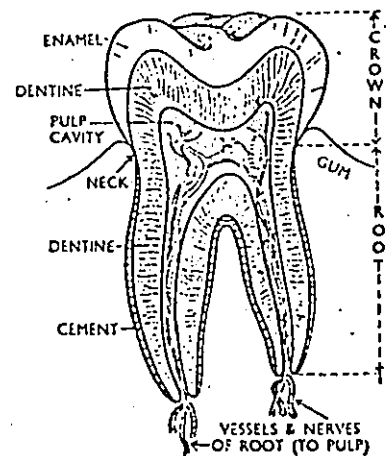


FIG. 183  
Diagram showing roots of  
the permanent teeth



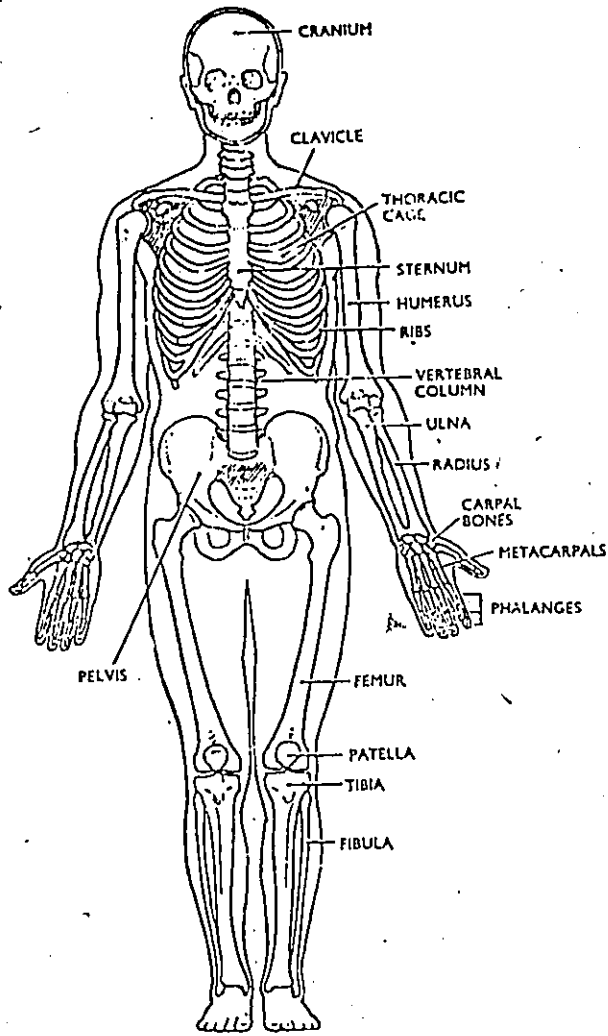


FIG. 35  
The skeleton  
(a) Anterior view

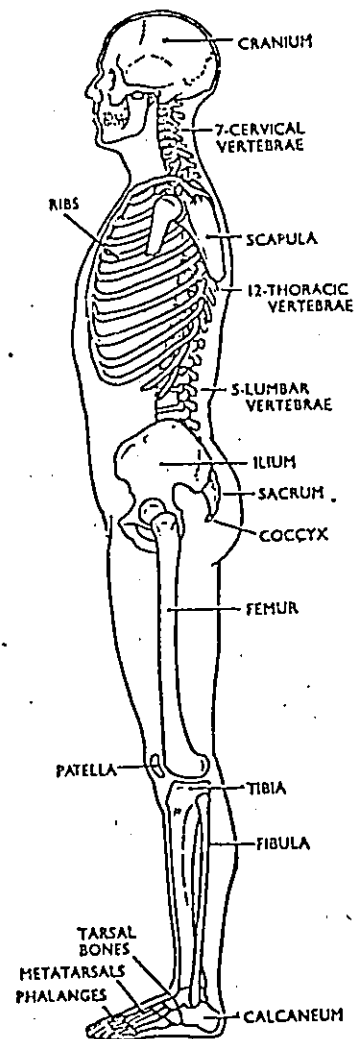


FIG. 35.  
The skeleton  
(b) Lateral view

## THE SYSTEMS AND CAVITIES OF THE BODY.

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A system can be described as a group of structures or organs which together carry an essential function. The systems can be classified as follows:

- Skeletal
- Muscular \*
- Circulatory\*
- Respiratory \*
- Digestive
- Urinary
- Nervous
- Endocrine
- Reproductive

The body as a whole is build around the bony framework of the skeleton and consists of:

- 1) the head and neck
- 2) the trunk, divided into the chest or thorax, the abdomen and pelvis.
- 3) the limbs. both upper and lower

The human body is divided into cavities and the amin organs of the body are contained in these cavities. There are four main cavities

- Cranial cavity
- Thoracic cavity
- Abdominal cavity
- Pelvic caviy

An example of a system, the heart and blood vessels constitute the "circulatory system " for the circulation of the blood.

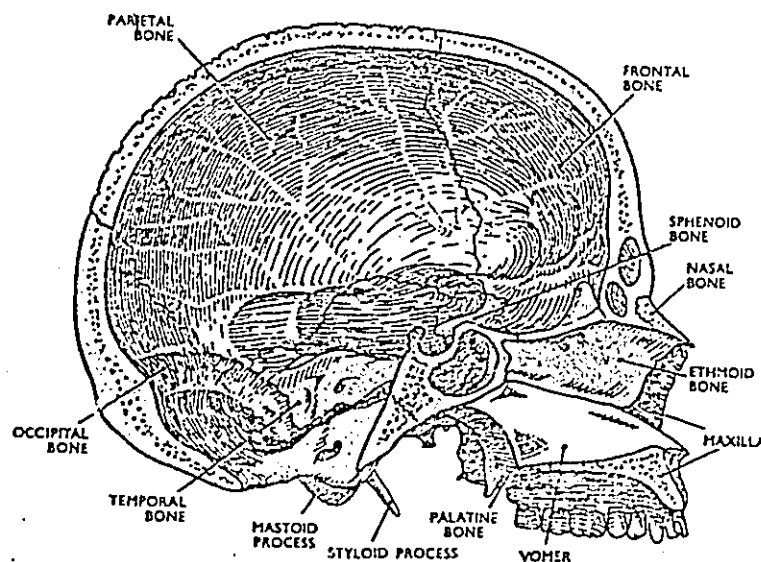


FIG. 29

Diagram illustrating the boundaries of the cranial cavity

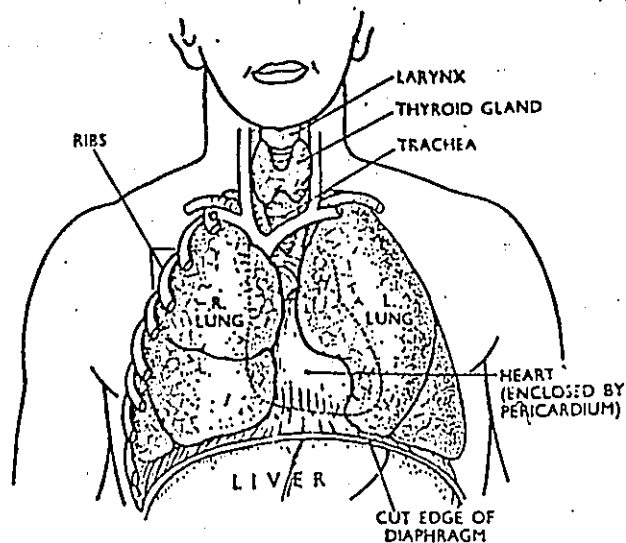


FIG. 30

Diagram showing main organs in the thoracic cavity

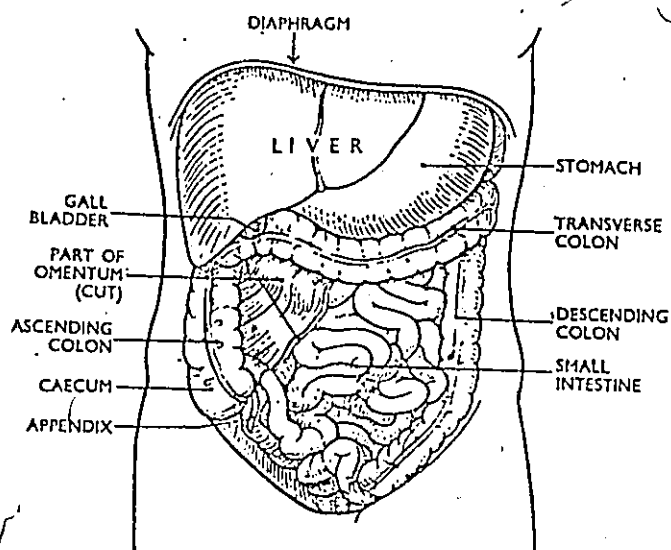


FIG. 31

Diagram showing some of the organs in the abdominal cavity

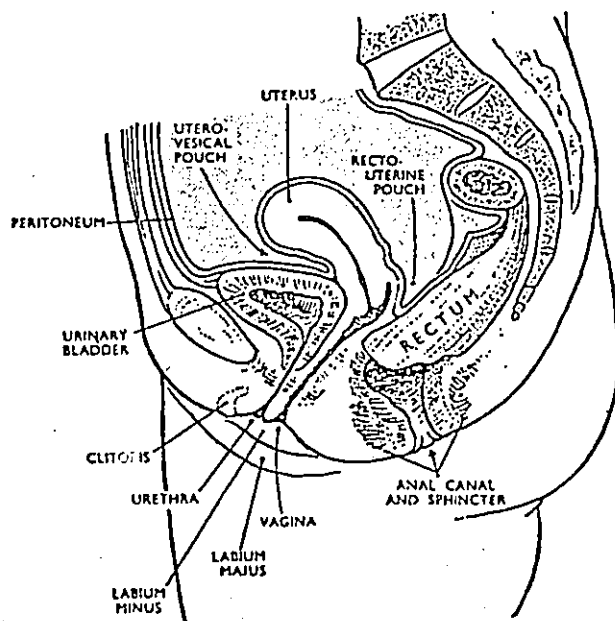


FIG. 33

Diagram showing main organs in the female pelvic cavity

## THE RESPIRATORY SYSTEM

255

The respiratory system is composed of various organs designed to ensure a clear pathway for the air to enter and leave the lungs.

The function of the respiratory system is, first to supply oxygen to the blood and, second to remove carbon dioxide.

Respiration is a two stages procedure, first the interchange of gases takes place in the tissues " Internal respiration " second the interchange of gases within the lungs " External respiration ".

Every cell in the body receives its supply of oxygen , at the same time gets rid of the products of oxidation; this is called breathing. Oxygen combining with the carbon and hydrogen of the tissues enables the metabolic processes of each individual cell to proceed, with the result that work is effected and waste products in the form of carbon dioxide (  $\text{CO}_2$  ) and water (  $\text{H}_2\text{O}$  ) are eliminated.

The mechanism of respiration is the process by which the lungs are expanded to take in the air, then to contract to expel it. The cycle of respiration consists of three phases:

- 1) The inspiration phase
- 2) The expiration phase
- 3) A pause

The cycle of respiration occurs about 16 times per minute, the expansion of the chest during inspiration occurs as a result of muscular activity which is partly voluntary and partly involuntary. The main muscles of respiration in normal quiet breathing are

- 1) the intercostal muscles
- 2) the Diaphragm.

The intercostal muscles are situated between the ribs, called intercostal space, these muscles are arranged in two layers, the external intercostal muscles the internal intercostal muscles

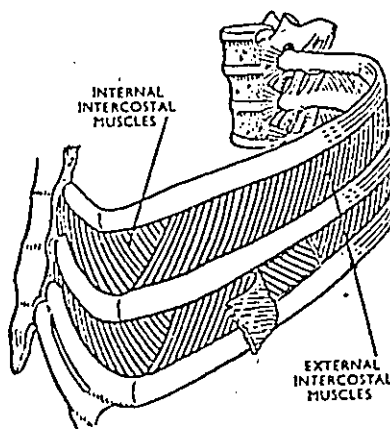
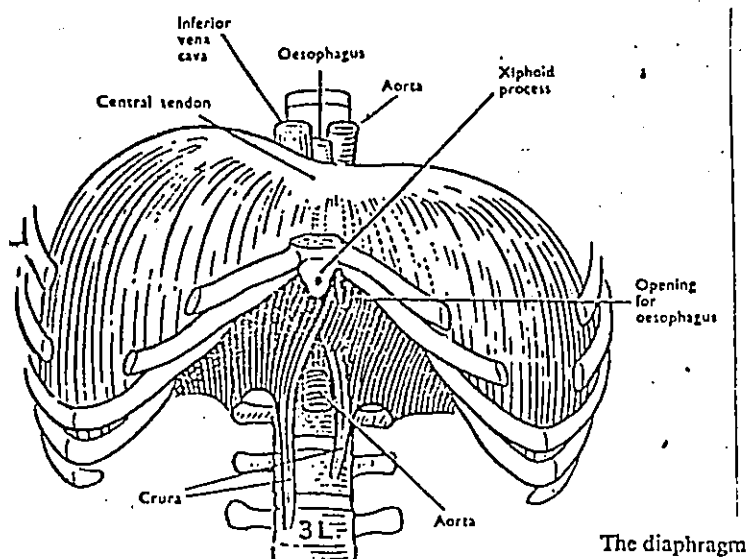


FIG. 85

The intercostal muscles

The diaphragm is a dome-shaped muscle when relaxed, it separates the thoracic cavity from the abdominal cavity. When the diaphragm contracts it is pulled downwards towards its origin ( the first three lumbar vertebrae and the ensiform process of the sternum and the lower ribs. ) This

increases the pressure on the abdominal organs and the abdominal wall will move outwards unless the abdominal muscles are consciously held and contracted. The diaphragm is supplied by the phrenic nerves.



It is important to realise that the intercostal muscles and the diaphragm contract simultaneously therefore ensuring the enlargement of the thoracic cavity in all directions, that is from back to front, side to side and from top to bottom.

The function of the lungs is the interchange of the gases oxygen and carbon dioxide.

The external respiration ( pulmonary respiration ) that oxygen enters through the nose and the mouth ( only the nose should be used ) as the function of the nose is very important it is to insure that the air entering the respiratory system is

warmed  
moistened  
filtered

This process occurs because the nose is lined with ciliated epithelium and richly supplied with blood.

Then the air after passing in the nose flows along the trachea and the bronchial tubes to the alveoli, where the air comes into close contact with the blood in the pulmonary capillaries, one layer membrane, the "alveolar- capillary membrane, separates the oxygen from the blood, oxygen passes across this membrane and is taken up by the haemoglobin of the red blood cells and carried to the heart from where it is then pumped in the arteries to all parts of the body. The blood leaves the lungs at an oxygen pressure of 100mm Hg, at this level the haemoglobin is 95% saturated with oxygen.

In the lungs, "carbon dioxide, a waste product of metabolism passes across the alveolar-capillary membrane from the blood capillaries to the alveoli, and passing through the bronchial tubes and trachea, is breathed out through the nose and mouth.

**Internal respiration ( tissue respiration ) :** the blood having its hemoglobin saturated with oxygen ( oxy-hemoglobin ) circulates throughout the body and finally reaches the capillary bed where the blood is now moving very slowly. The tissue cells take the oxygen from the rich hemoglobin to enable oxidation to go on, and the blood receives in exchange the waste products of oxidation " carbon dioxide ". The following changes take place in the composition of air in the alveoli, brought by external and internal or tissue respiration.

Inspired ( atmospheric ) air :

|                |       |
|----------------|-------|
| Nitrogen       | 79%   |
| Oxygen         | 20%   |
| Carbon dioxide | 0.04% |

Air entering the alveoli is of the temperature and humidity of the atmosphere

Expired air:

|                |       |
|----------------|-------|
| Nitrogen       | 79%   |
| Oxygen         | 16%   |
| Carbon dioxide | 4.04% |

Expired air is saturated with watery vapour and it is of the temperature of the body ( 20% of heat from the body is lost in warming expired air )

**Air capacity of the lungs:**

The total air capacity of the lungs is from 4,500 to 5,000ml or  $4\frac{1}{2}$  to 5 litres. Only a small proportion of this air ( 500ml or  $1/10$  is tidal air, which is the air inspired and expires in an ordinary quiet breathing.

**Vital Capacity.** The volume of air that can be made to pass into and out of the lungs by forcible inspiration and expiration is termed Vital capacity of the lungs. It is measured by means of a spirometer. In a normal man it is 4-5 litres and in a normal woman it is 3-4 litres. The vital capacity is reduced by disease of the lungs, by heart disease ( which causes congestion of the lungs ) and by weakness of the muscles of respiration.

**Rate and control of respiration :**

The mechanism of respiration is regulated and controlled by two principal factors:

1) chemical

2) nervous control

Certain factors stimulate the respiratory centre which is situated in the medulla oblongata in the brain, when stimulated the centre generates impulses which are transmitted by the spinal nerves to the muscles of respiration - the diaphragm and intercostals.

Nervous control, the respiratory centre is an automatic centre in the medulla oblongata from which impulses pass to the muscles of respiration. Impulses are passed to the diaphragm by the phrenic nerves, then at a lower level of the spinal cord impulses pass from the thoracic region via the intercostal nerves to stimulate the intercostal muscles. These impulses cause rhythmical contraction of the diaphragm and intercostal muscles at the rate of about 15 to 20 times per minute.

Chemical control, it is the ultimate factor in controlling and regulating the frequency, the rate, the depth of the respiratory movements. The respiratory centre in the medulla oblongata is extremely sensitive to the reaction of the blood; an alkaline reserve of blood must be maintained. Carbon dioxide is an acid product of the metabolism, and this acid chemical substance stimulates the respiratory centre to send out nerve impulses to act on the muscles of respiration. Nervous and chemical controls are essential, without either one of them man cannot continue to breathe.

"Our amazing machine, the human body, usually functions well in an exact manner and time. However, once in a while a part of this machine get sick so we need to visit the "Friendly Doctor" and get it fixed if possible.....

The best is to avoid and prevent a breakdown of the precious part of our body. Let's keep them in good shape, clean, well exercised, properly fueled with use of good food and oxygen. This marvellous machine should serve us well for many years to come if we look after it better..... Let's care for our body.

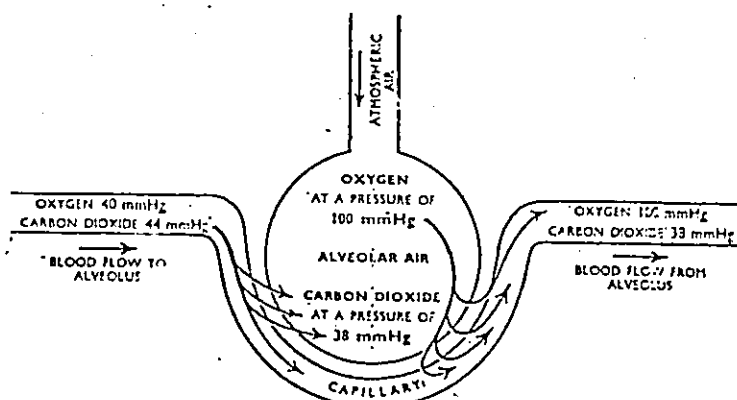


FIG. 172

Schematic illustration of the interchange of gases between the alveoli of the lungs and the capillaries within the lungs

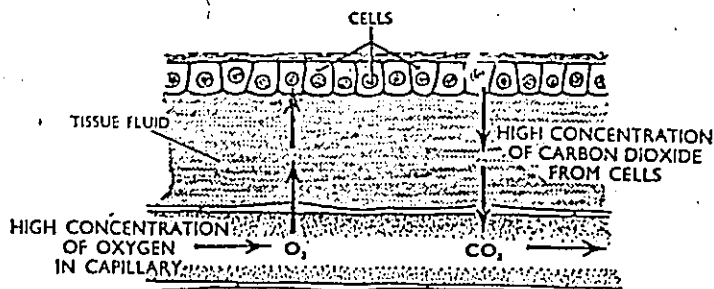


FIG. 175

Schematic diagram of internal respiration

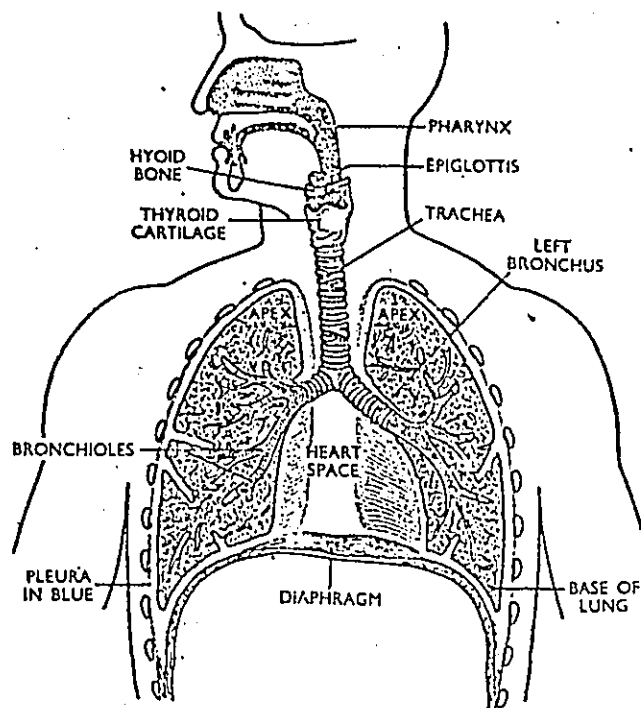


Fig. 150  
General view of respiratory organs

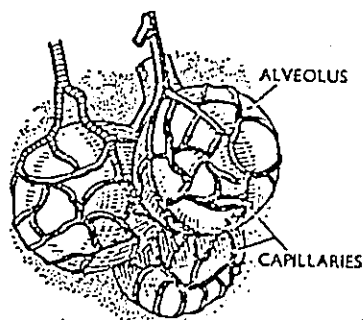
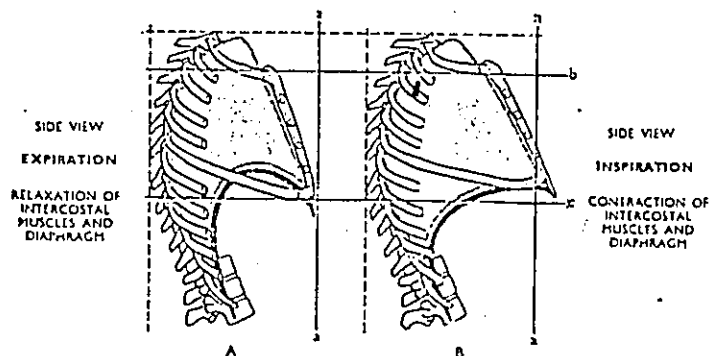
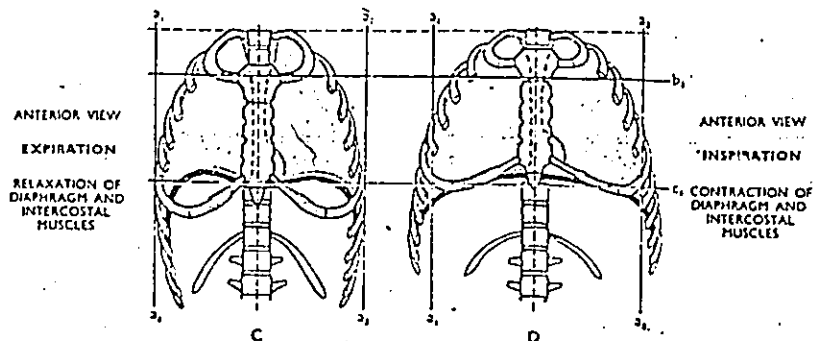


Fig. 173  
Diagram showing the capillary network surrounding the alveoli



- (1) Outward movement of ribs as shown by line a-a
- (2) Upward movement of ribs as shown by lines b and c
- (3) Change in position of diaphragm due to its contraction
- (4) The resulting increase in the size of the lungs



- (1) Outward movement of ribs as shown by lines a<sub>1</sub>-a<sub>2</sub> and a<sub>1</sub>-a<sub>3</sub>
- (2) Upward movement of ribs as shown by lines b<sub>1</sub> and c<sub>1</sub>
- (3) Change in position of diaphragm due to its contraction
- (4) The resulting increase in the size of the lungs

Fig. 171

Scheme showing changes in the size of the thoracic cavity due to contraction of the muscles of respiration

## APPENDIX H

DRUGS USED BY SUBJECTSDURING PROJECT

Drugs Used by Subjects During Project

- A) Alupent - Ampicillin - Aminophylline - Actifed - Amoxil -  
Aldactazide - Amitriptyline - Apo Sulfatrim - Atrovent
- B) Beclovent - Becinase - Berotec - Bricanyl - Betaloc - Bactrim -  
Becotide
- C) Choledyl - Cortisone - Cloxicillin
- D) Deltasone - Diazepam
- E) Erythromycin - Etrafon D - (conjugated) Estrogen
- F)
- G)
- H) Hydrochlorothiazide
- I) Intal - Isomophyllin - Isuprel
- J)
- K) (slow) K-600
- L)
- M) Megacillin
- N) Nova Tetra - Novahistex (decongestant)
- O) Oxtriphylline
- P) Prednisone - Phyllocontin - Primateen - Protophylline
- Q) Quadrinal
- R) Rynacrom - Rhinalar
- S) Serax - Sulfatrim - Sudafed - Septra - Somophyllin-12 - Salbutamol

## Drugs Used - 2.

T) Theodur - Tedral - Tetracycline - Tetrex - Tepratal -

Trimaminic (decongestant)

U)

V) Ventolin - Vabramycin

W)

X)

Y)

Z)

## APPENDIX I

PROGRAM EXPECTATIONS  
AND EVALUATIONS  
QUESTIONNAIRE

Program Expectation Questionnaire

Now that you have had an opportunity to become familiar with the format and structure of the program you are involved in, we would like to know what are your expectations for this program.

- Circle the appropriate dot on each of the scales below, as to how beneficial you expect this program to be for you if you attend regularly.

1. How successful do you think this program will be in helping you control the frequency of your asthmatic attacks?

Not . . . . . Extremely  
Successful . . . . . Successful

2. How successful do you think this program will be in helping you decrease the amount of medication you require?

Not . . . . . Extremely  
Successful . . . . . Successful

3. How successful do you think this program will be in helping you increase your exercise tolerance?

Not . . . . . Extremely  
Successful . . . . . Successful

4. How successful do you think this program will be in enabling you to pursue more recreational & social activities?

Not . . . . . Extremely  
Successful . . . . . Successful

5. Overall, how much do you think you will benefit from this program?

Not at all . . . . . A great deal

## APPENDIX J

NEWSPAPER ADVERTISEMENTS

Ottawa Citizen, November 12, 1981

## Asthma Sufferers

A new treatment program for asthmatics is being clinically tested by researchers at the University of Ottawa. A multidisciplinary team of investigators from Medicine, Psychology, and Kinesiology is now accepting applications from persons suffering from asthmatic problems for participation into a new 16 week therapy program beginning in January.

If you are between the ages of 17 and 40, suffer from asthma, have no other medical difficulties, and are willing to take part in an innovative respiratory and physical retraining program, call the following number between 3:30 pm and 5:30 pm and ask for more information on the Asthma Project.

**231-3276**

This experimental program is being offered at no charge for participants who qualify and who are willing to provide clinical and scientific information before, during, and following the termination of the program. More detailed information will be mailed out on request.

University of Ottawa **FULCRUM**  
November 12, 1981

## ASTHMA SUFFERERS

A new treatment program for asthmatics is being clinically tested by researchers at the University of Ottawa. A multidisciplinary team of investigators from Medicine, Psychology, and Kinesiology is now accepting applications from persons suffering from asthmatic problems for participation into a new 16 week therapy program beginning in January.

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## APPENDIX K

LETTER TO RADIO AND TV STATIONS  
WITH PUBLIC ANNOUNCEMENT REQUEST

October 27th, 1981.

I am presently involved in a multidisciplinary research project at the University of Ottawa and am responsible for advertising a new treatment program for asthmatics. We will soon be accepting applications for participation from persons suffering from asthmatic problems.

We would very much appreciate it if you would run the following explanation during your public announcement times during the week of November 9th - November 15th.

A new treatment program for asthmatics is being clinically tested by researchers at the University of Ottawa. A multidisciplinary team of investigators from Medicine, Psychology, and Kinesiology is now accepting applications from persons suffering from asthmatic problems for participation into a new 16-week therapy program beginning in January.

If you are between the ages of 17 and 40, suffer from asthma, have no other medical difficulties, and are willing to take part in an innovative respiratory and physical retraining program, call the following number between 3:30 p.m. and 5:30 p.m., Monday to Friday, and ask for more information on the Asthma Project.

231-3276

This program is being offered at no charge for participants who qualify for the program.

.../2

If you should require additional information for this public announcement request, please contact Dr. Michel Girodo at 231-4242 between 9:00 a.m. - 4:00 p.m.

Thank you for your time and cooperation,

Sincerely,

Ken Ekstrand,  
Ph.D. student.

Michel Girodo, Ph.D.,  
Project Supervisor,  
Professor of Psychology.

# Asthma Sufferers

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A new treatment program for asthmatics is being clinically tested by researchers at the University of Ottawa. A multidisciplinary team of investigators from Medicine, Psychology, and Kinanthropology is now accepting applications from persons suffering from asthmatic problems for participation into a new 16 week therapy program beginning in January.

If you are between the ages of 17 and 40, suffer from asthma, have no other medical difficulties, and are willing to take part in an innovative respiratory and physical retraining program, call the following number between 3:30 pm and 5:30 pm and ask for more information on the Asthma Project.

231-3276

This experimental program is being offered at no charge for participants who qualify and who are willing to provide clinical and scientific information before, during, and following the termination of the program. More detailed information will be mailed out on request.

APPENDIX L

## LIST OF RADIO AND TV STATIONS WHICH BROADCAST ANNOUNCEMENT

- 1) CFGO - 1440
- 2) CFMO-FM- 93.9
- 3) CFRA - 58
- 4) CKBY-FM - 105.3
- 5) CKOY - 1310
- 6) CKO-FM - 106.9
- 7) CHEZ-FM - 106
- 8) CJOH-TV
- 9) CBO
- 10) CBOT-TV
- 11) CHRO-TV

APPENDIX M  
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Statistical Power of Dependent Measure Contrasts  
-----

| Measure           | M1 - M2<br>(difference between<br>group means) | Population<br>Standard<br>Deviation | G<br>(Effect<br>size) | Power |
|-------------------|------------------------------------------------|-------------------------------------|-----------------------|-------|
| Medication        | 100.300                                        | 108.690                             | 3.774                 | 0.960 |
| Attack Time       | 1.110                                          | 10.280                              | 0.441                 | 0.080 |
| Attack Intensity  | 2.180                                          | 2.520                               | 3.937                 | 0.970 |
| Asthma Symptoms   | 44.000                                         | 89.000                              | 2.004                 | 0.520 |
| Vital Capacity    | 393.300                                        | 894.800                             | 1.320                 | 0.260 |
| FEV               | 496.500                                        | 918.960                             | 0.550                 | 0.085 |
| MHR               | 22.760                                         | 18.250                              | 3.791                 | 0.970 |
| Lactic Acid       | 7.870                                          | 11.060                              | 2.136                 | 0.560 |
| Pyruvic Acid      | 0.248                                          | 0.325                               | 2.043                 | 0.520 |
| PH                | 0.016                                          | 0.043                               | 1.116                 | 0.200 |
| Base Excess       | 0.480                                          | 1.180                               | 1.224                 | 0.220 |
| Hematocrit        | 2.380                                          | 3.850                               | 1.857                 | 0.440 |
| Hemoglobin        | 0.730                                          | 1.520                               | 1.440                 | 0.290 |
| Physical Activity | 35.330                                         | 51.010                              | 2.833                 | 0.800 |
| Social Activity   | 60.290                                         | 67.930                              | 3.831                 | 0.970 |
| Self-Esteem       | 0.519                                          | 2.722                               | 0.779                 | 0.130 |

## APPENDIX N

## Pearson Product-Moment-Correlation Coefficients Between

## All Pre-test Dependent Variables

| Variable            | 2    | 3      | 4     | 5       | 6     | 7       | 8     | 9       | 10      | 11      | 12      | 13    | 14      | 15       | 16      | 17       | 18      | 19      | 20      | 21       |
|---------------------|------|--------|-------|---------|-------|---------|-------|---------|---------|---------|---------|-------|---------|----------|---------|----------|---------|---------|---------|----------|
| 1 Medication        | 0.11 | -0.01  | -0.13 | -0.12   | 0.02  | -0.001  | 0.02  | 0.08    | 0.05    | 0.04    | 0.03    | -0.21 | -0.22   | 0.08     | 0.29    | -0.31    | -0.06   | -0.10   | -0.12   | 0.08     |
| 2 Attack Time       | -    | 0.38 * | 0.16  | 0.30 *  | 0.28  | -0.23   | -0.12 | -0.22   | -0.02   | -0.11   | -0.09   | -0.05 | -0.07   | -0.04    | 0.20    | -0.23    | -0.04   | 0.01    | -0.02   | -0.08    |
| 3 Attack Intensity  | -    | -      | 0.13  | 0.03    | 0.06  | -0.27   | -0.24 | -0.19   | -0.16   | -0.23   | -0.16   | 0.19  | 0.13    | 0.11     | -0.03   | 0.02     | 0.27    | 0.21    | 0.16    | -0.01    |
| 4 Asthma Symptoms   | -    | -      | -     | -0.34 * | -0.09 | 0.38 *  | 0.28  | 0.07    | 0.18    | 0.13    | 0.28    | -0.11 | -0.16   | 0.13     | 0.55 ** | -0.56 ** | 0.04    | 0.004   | 0.08    | -0.13    |
| 5 Physical Activity | -    | -      | -     | -       | -0.08 | -0.07   | -0.28 | -0.14   | -0.23   | -0.24   | -0.28   | -0.05 | -0.11   | -0.02    | -0.19   | 0.18     | -0.31 * | -0.13   | -0.17   | -0.37 *  |
| 6 Social Activity   | -    | -      | -     | -       | -     | -0.32 * | -0.05 | -0.03   | -0.01   | 0.01    | -0.08   | 0.23  | 0.01    | -0.24    | 0.19    | -0.18    | 0.18    | 0.23    | 0.07    | 0.09     |
| 7 Self-esteem       | -    | -      | -     | -       | -     | -       | -0.07 | -0.16   | -0.07   | -0.07   | -0.04   | -0.25 | -0.30   | 0.32 *   | 0.35 *  | -0.33 *  | 0.06    | 0.06    | -0.40 * | -0.43 ** |
| 8 Expf 1            | -    | -      | -     | -       | -     | -       | -     | 0.84 ** | 0.89 ** | 0.90 ** | 0.93 ** | -0.13 | -0.03   | 0.15     | -0.14   | 0.15     | -0.02   | -0.05   | 0.54 ** | 0.20     |
| 9 Expf 2            | -    | -      | -     | -       | -     | -       | -     | -       | 0.82 ** | 0.87 ** | 0.90 ** | -0.14 | -0.03   | 0.15     | -0.20   | 0.22     | -0.14   | -0.16   | 0.46 ** | 0.09     |
| 10 Expf 3           | -    | -      | -     | -       | -     | -       | -     | -       | -       | 0.97 ** | 0.91 ** | -0.06 | 0.01    | 0.03     | -0.14   | 0.17     | 0.03    | -0.04   | 0.54 ** | 0.17     |
| 11 Expf 4           | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | 0.93 ** | -0.11 | -0.05   | 0.13     | -0.14   | 0.17     | 0.02    | -0.03   | 0.49 ** | 0.18     |
| 12 Expf 5           | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -0.16 | -0.07   | 0.27     | -0.12   | 0.14     | -0.03   | -0.09   | 0.45 ** | 0.10     |
| 13 VC               | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | 0.93 ** | -0.59 ** | 0.03    | -0.05    | 0.42 *  | 0.42 *  | 0.11    | 0.18     |
| 14 FEV              | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -0.57 ** | -0.19   | 0.18     | 0.16    | 0.07    | 0.11    | 0.11     |
| 15 MHR              | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -        | 0.03    | -0.03    | 0.05    | 0.02    | -0.21   | -0.22    |
| 16 PH               | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -        | -       | -0.99 ** | -0.05   | -0.08   | -0.15   | -0.05    |
| 17 Base             | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -        | -       | -        | 0.04    | 0.06    | 0.18    | 0.04     |
| 18 HRC              | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -        | -       | -        | -       | 0.96 ** | 0.08    | 0.15     |
| 19 EB               | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -        | -       | -        | -       | -       | -0.01   | 0.06     |
| 20 LA               | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -        | -       | -        | -       | -       | -       | -        |
| 21 PA               | -    | -      | -     | -       | -     | -       | -     | -       | -       | -       | -       | -     | -       | -        | -       | -        | -       | -       | -       | 0.65 **  |

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

APPENDIX O

Means and Standard Deviations for Pre-Test  
Dependent Variables, by Group

| Variable           | GROUP        |              |              |                    |
|--------------------|--------------|--------------|--------------|--------------------|
|                    | Ta<br>(n=15) | Tn<br>(n=17) | Te<br>(n=12) | Controls<br>(n=23) |
| MEDICATION         |              |              |              |                    |
| Mean               | 95.80        | 107.35       | 162.08       | 138.83             |
| Standard Deviation | 81.05        | 105.96       | 99.17        | 119.94             |
| ATTACK TIME        |              |              |              |                    |
| Mean               | 6.41         | 9.08         | 3.11         | 3.90               |
| Standard Deviation | 6.99         | 18.72        | 4.15         | 5.34               |
| ASTHMA SEVERITY    |              |              |              |                    |
| Mean               | 276.93       | 275.00       | 266.50       | 237.17             |
| Standard Deviation | 78.63        | 85.12        | 85.55        | 80.20              |
| PHYSICAL ACTIVITY  |              |              |              |                    |
| Mean               | 63.27        | 56.38        | 93.92        | 95.45              |
| Standard Deviation | 45.45        | 58.70        | 53.49        | 39.84              |
| SOCIAL ACTIVITY    |              |              |              |                    |
| Mean               | 135.83       | 104.64       | 62.82        | 56.96              |
| Standard Deviation | 49.68        | 47.65        | 62.04        | 74.63              |

## APPENDIX O (continued)

Means and Standard Deviations for Pre-Test  
Dependent Variables, by Group

| Variable                 | GROUP       |              |             |                    |
|--------------------------|-------------|--------------|-------------|--------------------|
|                          | Ta<br>(n=9) | Tn<br>(n=10) | Te<br>(n=8) | Controls<br>(n=11) |
| PH                       |             |              |             |                    |
| Mean                     | 7.32        | 7.32         | 7.30        | 7.31               |
| Standard Deviation       | 0.06        | 0.05         | 0.03        | 0.04               |
| BASE EXCESS              |             |              |             |                    |
| Mean                     | 20.00       | 20.08        | 20.56       | 20.21              |
| Standard Deviation       | 1.43        | 1.38         | 0.84        | 1.06               |
| HEMATOCRIT               |             |              |             |                    |
| Mean                     | 45.89       | 45.22        | 48.44       | 47.46              |
| Standard Deviation       | 5.53        | 2.87         | 2.90        | 3.28               |
| HEMOGLOBIN               |             |              |             |                    |
| Mean                     | 15.59       | 15.82        | 16.61       | 16.26              |
| Standard Deviation       | 1.94        | 1.34         | 1.34        | 1.45               |
| LACTIC ACID              |             |              |             |                    |
| Mean                     | 36.49       | 26.09        | 28.13       | 20.42              |
| Standard Deviation       | 10.98       | 6.84         | 8.72        | 10.91              |
| PYRUVIC ACID             |             |              |             |                    |
| Mean                     | 1.01        | 0.78         | 0.63        | 0.54               |
| Standard Deviation       | 0.56        | 0.22         | 0.20        | 0.30               |
| FORCED EXPIRATORY VOLUME |             |              |             |                    |
| Mean                     | 3080.00     | 3158.75      | 3600.00     | 3624.55            |
| Standard Deviation       | 923.07      | 425.76       | 1486.67     | 817.32             |
| VITAL CAPACITY           |             |              |             |                    |
| Mean                     | 3490.00     | 3644.00      | 3970.00     | 3968.18            |
| Standard Deviation       | 712.20      | 563.11       | 1393.60     | 920.38             |
| MAXIMAL HEART RATE       |             |              |             |                    |
| Mean                     | 167.50      | 149.30       | 139.25      | 131.27             |
| Standard Deviation       | 12.49       | 14.83        | 8.14        | 13.78              |