University of Alberta

Imagery and Asthma: Development and Testing of a Treatment Protocol

by

Keith E. Zukiwski

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Education

in

Counselling Psychology

Department of Educational Psychology

Edmonton, Alberta

Fall 1996

ISBN 0-612-18227-4

Canada

University of Alberta

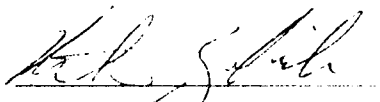
Library Release Form

Name of Author: Keith E. Zukiwski

Title of Thesis: Imagery and Asthma: Development and Testing of a Treatment Protocol

Degree: Master of Education

Year of Degree Granted: 1996



12223-54 Street

Edmonton, Alberta

Canada

T5W 3H1

October 2, 1996

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommended to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Imagery and Asthma: Development and Testing of a Treatment Protocol submitted by Keith E. Zukiwski in partial fulfillment of the requirements for the degree of Master of Education in Counselling Psychology.

Dr. B. L. Paulson (Supervisor)
Department of Educational Psychology

Dr. R. J. Sobsey
Department of Educational Psychology

September 24, 1996

Dr. R. Moqbel
Department of Medicine

DEDICATION

I dedicate this thesis to my father, Michael M. Zukiwski, who died of mesothelioma in 1992. It was his courage and suffering that inspired me to want to help those afflicted with physical disease.

ABSTRACT

Imagery is widely used as an adjunct treatment of cancer, asthma, and other physical illnesses. Unfortunately, there has been little controlled clinical research on the efficacy of this approach. This pilot study was conducted to refine a treatment protocol to be used in a future controlled study investigating the efficacy of relaxation-assisted imagery as an adjunct treatment for asthma. The hypothesis is that adults with asthma who are trained in, and practice, using imagery representing desirable functional and cellular changes in the airways will demonstrate improvement in lung function when compared to baseline. Three adult subjects, with mild to severe asthma, attended 8 weekly treatment sessions following a 4 week baseline. Outcome measures included: (a) assessments of spirometry, total lung capacity, and diffusing capacity; and (b) daily self-reports of symptoms, medication usage, and peak expiratory flow. The results indicate that all 3 subjects improved on a variety of outcome measures.

ACKNOWLEDGEMENTS

This pilot study is supported in part by the Alberta Asthma Centre, a studentship from the Medical and Scientific Section of The Alberta Lung Association, and an operating grant from the Caritas Research Steering Committee (part of the Caritas Health Group: Edmonton General Hospital, Grey Nuns Hospital, and Misericordia Hospital).

I wish to express my deep appreciation to the following individuals:

Dr. Barbara Paulson, thesis supervisor and Associate Professor, Department of Educational Psychology, for her understanding, patience, and support.

Dr. Dean Befus, Professor of Medicine, Director and Astra Chair of Research at the Alberta Asthma Center, and Director of the University of Alberta Pulmonary Research Group, for his unwavering interest, and assistance in research design and establishing contacts with physicians and asthma specialists.

Dr. Redwan Moqbel, Professor of Medicine and asthma researcher at the University of Alberta Pulmonary Research Group, for his encouragement, enthusiasm, participation on the thesis committee, and assistance in research design and development of the treatment protocol.

Dr. Richard Sobsey, who provided assistance with regards to within subject research design, and participation on the thesis committee.

Special thanks to Dr. Fred MacDonald, Clinical Professor and pulmonologist at the Grey Nuns Hospital, for his assistance in participant selection and recruitment. Without his invitation to conduct recruiting and lung function assessments at the Grey Nuns Hospital, the logistics of this research may have been insurmountable.

Respiratory therapists, Linda Ferguson and Jennifer Barchard who assisted in participant selection and recruitment. I greatly appreciate their expertise in assessing lung function and serving as liaisons with the study participants.

Dr. Patrick Hessel, Associate Professor, and epidemiologist at the Alberta Asthma Centre, who provided mini-Wright Peak Flow Meters for this project.

Dr. Richard Jones, Professor of Medicine, who provided assistance in the interpretation of the lung function assessments.

Dr. Andrew Cave, Assistant Professor, Department of Family Medicine, for his insight into clinical issues pertinent to the research design.

Dr. Howard Hall, Assistant Professor, Department of Pediatrics, Case Western Reserve University, whose research in psychoneuroimmunology inspired me to apply his findings to a clinical population.

The participants in the study, who were willing to share their personal experiences of asthma and commit to repeated assessments of lung function, attending treatment sessions, and practicing the treatment at home.

My classmates, for their encouragement, and in particular, Anju Anand who graciously provided editorial assistance.

Finally, I wish to thank my wife Kendra, for her support and patience during the many long days and nights that were consumed by this project.

TABLE OF CONTENTS

Introduction **1**

Psychoneuroimmunology and Intentional Immunomodulation:

Conditioning, Hypnosis, and Imagery **3**

Introduction 4

Psychoneuroimmunology 4

Stress and Emotions 5

Interventions 10

Conditioning 11

Hypnosis and Imagery 14

Conclusions 28

References 30

Imagery and Asthma: Development of a Treatment Protocol **38**

Introduction 39

Asthma 40

Treatment Protocol 42

Case 1- Jane 44

Case 2- Susan 52

Case 3- John 54

Discussion 58

References 62

Self-Generated Imagery as an Adjunct Treatment for Asthma: A Pilot Study. **65**

Introduction 66

Method 69

Results 75

Discussion 84

References 87

Conclusion **93**

Appendix A: Treatment Protocol for Session 1 ..... **94**

Appendix B: Treatment Protocol for Session 2 ..... **95**

Appendix C: Treatment Protocol for Sessions 3-8 ..... **99**

Appendix D: Consent for Patients **102**

Appendix E: Patient Information Sheet **103**

LIST OF TABLES

Table 3-1. Spirometric data for Case 1 76
Table 3-2. Spirometric data for Case 2 79
Table 3-3. Spirometric data for Case 3 82

LIST OF FIGURES

Figure 3-1. Case 1. AM and PM peak expiratory flow rates..... 77
Figure 3-2. Case 1. Self-report ratings of symptom severity..... 78
Figure 3-3. Case 2. AM and PM peak expiratory flow rates..... 80
Figure 3-4. Case 2. Self-report ratings of symptom severity..... 81
Figure 3-5. Case 3. AM and PM peak expiratory flow rates..... 83
Figure 3-6. Case 3. Self-report ratings of symptom severity..... 84

INTRODUCTION

Psychologists can play an important role in the lives of those suffering from physical illness, whether severe and life-threatening, or chronic and disabling. They may be called upon to help deal with the trauma of approaching death, treat symptoms such as pain, and even attempt treatment of the disease process. The latter role was at one time primarily filled by psychiatrists and other physicians who used hypnotherapy to treat disorders that were believed to be of psychosomatic origins. Recently, a variety of health care professionals have been treating physical diseases with psychological techniques that include, but are not limited to, biofeedback, progressive muscle relaxation, meditation, yoga, hypnosis, and imagery.

Psychological interventions that can induce specific changes in the immune system may be beneficial in the treatment of diseases such as cancer. Increasing the numbers or activity of natural killer (NK) cells, for example, may bolster the immune system enough to slow or stop the development of a tumor. Other diseases, such as asthma, involve an over active immune system which may be treated by decreasing the numbers or activation of certain cells.

Research into the ability of psychological interventions to influence the immune system is still in its infancy, however, the existing literature suggests that it is possible to suppress or enhance specific parts or responses of the immune system while leaving other aspects of the system relatively unaffected.

This thesis presents the background, design, and results of a pilot study conducted to examine the use of a psychological intervention involving imagery as an adjunct treatment for asthma. The treatment protocol, refined through use in this study, may be used in an future controlled study.

The first paper provides an overview of the areas of psychoneuroimmunology that may be of particular interests to psychologists. Selected studies are presented which demonstrate that factors such as stress can suppress the immune system. This is followed

by a review of studies suggesting that it may be possible to target specific desired immune system changes using three psychological interventions: conditioning, hypnosis, and imagery. A discussion of clinical applications and techniques used in these approaches is followed by the brief mention of related issues: ultradian rhythms, hypnotic susceptibility, and belief.

The second paper briefly reviews research on imagery related immunomodulation and psychological treatments of asthma. Research findings suggest that imagery may have potential as an adjunct treatment for asthma. The development and clinical application of a treatment protocol for asthma is discussed. Three case studies are presented to illustrate clinical procedures, researcher and participant experiences, and implications for future research.

The third paper is a concise presentation of the methodology and results from this study.

Running head: PNI AND INTENTIONAL IMMUNOMODULATION

Psychoneuroimmunology and Intentional Immunomodulation: Conditioning, Hypnosis, and Imagery

Keith E. Zukiwski

University of Alberta

This paper is intended to provide an introduction to the field of psychoneuroimmunology with particular focus on topics which will likely be of interest to psychologists whose clients suffers from stress and/or physical disease. Interventions such as relaxation (Kiecolt-Glaser, et al., 1985), and relaxation and education (Schedlowski, Jung, Schimanski, Tewes, & Schmoll, 1994), have demonstrated associated changes in the immune system. However, only conditioning, hypnosis, and imagery have been used to target specific desired changes. For this reason I will limit our review to the latter approaches. Examples of the research on the immunomodulating effects of stress and emotion, intentional immunomodulation, and techniques used in clinical practice will be followed by a brief discussion of four related areas of interest to the researcher and clinician: ultradian rhythms, hypnotic susceptibility, trauma induced hypnosis, and belief. The scope of this paper does not permit a thorough review of each of these areas. Instead, landmark studies are described in detail and references of numerous reviews are provided for those with further interest.

Psychoneuroimmunology

Definition

Psychoneuroimmunology (PNI), has been defined as: "a defined interdisciplinary field dealing with the complex bidirectional interactions of the central nervous system (CNS) mediating emotions and behavior and the immune system" (Solomon, 1987, p. 628), "the study of interactions between behavior, the nervous system, and the immune system (Maier, Watkins, & Fleshner, 1994, p. 1004), and the study of behavioural-neural-endocrine-immune system interactions" (Ader, Cohen, & Felten, 1995, p. 99).

PNI research encompasses such a broad domain of study that Udelman and Udelman (1990) describe 5 categories of PNI: psychoimmunology, immunopsychiatry, immunoneurology, neuro-immunoregulation, and neuro-immunopharmacology. Unfortunately, such discipline specific labels contribute to the division of research into fields of study that may not be accessed by researchers in related and overlapping fields. I

prefer the use of the more global term "PNI" as it facilitates interdisciplinary understanding and research. Solomon (1993) contends that PNI "represents a conceptual breakthrough that offers the opportunity, at last, to approach the body and its health and disorders from a new systems theoretical perspective" (p. 352).

Reviews

Until recently, the immune and nervous systems were believed to operate independently of each other. Numerous PNI studies which document the many bidirectional molecular and biochemical interactions between the two systems refute this belief. A small sample of the reviews available include: general overviews of PNI (Maier et al., 1994; Rossi, 1993; Vollhardt, 1991), the interactions between the nervous, endocrine, and immune systems (Ader et al., 1995; Bateman, Singh, Kral, & Solomon, 1989; Cohen, Ader, & Felton, 1994; Jankovic, 1991), PNI and HIV (Gorman & Kertzner, 1990; Solomon, 1987), PNI and cancer (Antoni, 1987), and mental illness and immunosuppression (O'Donnell, Silove, & Wakefield, 1988).

PNI research of most interest to the psychologist would likely include the study of conditioning effect on the immune system (Ader & Cohen, 1991), stress related immunosuppression (Kiecolt-Glaser & Glaser, 1991), and modulation of the immune system through psychological interventions (Hall, 1990; Hall & O'Grady, 1991; Kiecolt-Glaser & Glaser, 1992).

Stress and Emotions

It is important for a clinician to understand the negative effects of stress on the immune system and the potential importance of alleviating it. Studies have demonstrated that a wide range of mental and physical stressors can influence the immune system, usually in the direction of immune suppression. In the following section, I will describe, first, several studies which suggest that stress and emotions can alter immune function, and then, the association found between personality and cancer.

Short term mood states. There is some evidence that short term negative mood states can affect the immune system, although not necessarily in the expected direction of immune suppression. A recent study (Futterman, Kemeny, Shapiro, & Fahey, 1994) examined the effect of experimentally induced positive and negative moods on the immune system. In order to increase the likelihood of obtaining the desired mood states and to minimize embarrassment felt by subjects when displaying emotions, this study used male actors trained in "method" acting as the experimental group ($n = 14$), and non-actors as a comparison group ($n = 9$). Using semi-structured improvisations the actors were, on separate days, instructed to experience negative (depression) and positive (happiness) arousal of low and high intensity. Blood samples were taken before and after a 20 minute period of the experimentally induced mood. A final blood sample was taken an additional 20 minutes later to help to determine time related changes of immune function. The immune parameters included: number and function of circulating NK cells, number of T cells (suppressor/cytotoxic), total lymphocyte counts, and phytohemagglutinin (PHA) induced proliferation. Interestingly, there was an increase in NK cell numbers and activity, and an increase in the percent of suppressor/cytotoxic T cells following both negative and positive mood state. These increases rapidly returned to baseline levels within 20 minutes of the cessation of the mood state. Futterman et al. stated that the direction of change, which is opposite to that observed in studies of long-term negative mood states such as bereavement, is consistent with the literature on short-term stress effects. Evidence of short term immunosuppression as a result of expression of negative emotions was indicated by the immune response to the mitogen PHA. The response increased with positive mood and decreased with negative mood.

Depression. Evidence that depression can have immunosuppressive effects may have important implications for treatment of disease involving the immune system. For example, cancer patients require strong immune systems to fight malignant tumor cells.

Levy, Herberman, Lippman, and d'Angelo (1987) examined the relationship between NK cell activity and psychological status in 75 women recently diagnosed with breast cancer. Baseline measurements were taken 5 to 7 days following initial surgery but prior to release of results of nodal dissection. Follow-up measurements were taken during an out-patient visit 3 months after the initial assessment. The Profile of Mood States, Global Adjustment to Illness Scale, and a structured interview were used to assess perception of interpersonal support, degree of adjustment, and mood state. While radiation or chemotherapy treatments did not significantly change NK cell activity over the 3 month period, decreased NK activity tended to occur in patients that reported lack of family support and symptoms described as "depressive, fatigue-like" (Levy et al., p. 351). These factors accounted for 30% of the variance in NK cell activity. Levy et al. suggest that these psychological markers could be used to identify biologically vulnerable patients who could then be treated with psychological interventions to reduce the risk factors.

Sleep deprivation. Sleep deprivation is frequently seen in clients with depression, anxiety, chronic stress, or environmental demands. The importance of sleep to the human immune system was demonstrated in a study by Irwin et al. (1994) in which 23 males were deprived of 4 hours of sleep. The subjects were deprived of sleep between 3 and 7 AM, simulating late insomnia. This amounted to a reduction of total sleep that was approximately 45% of that of a control night in the sleep laboratory. After one night of partial sleep deprivation, NK cell activity was significantly reduced by nearly 30% compared to baseline, $p < .01$. The level of NK cell activity returned to baseline values after a subsequent night of normal sleep. While there was an overall decline in NK cell activity, the decline actually occurred in only 18 of the 23 subjects. Two subjects demonstrated no change and 3 subjects had slight increases.

Uthgenannt, Schoolmann, Pietrowsky, Fehm, and Born (1995) found that after 3 hours of sleep, compared to wakefulness, there was decreased production of tumor necrosis factor-α and interleukin-1β, $p < .01$, and enhanced production of interleukin-2

(IL-2), $p < .05$. The increased production of IL-2 during sleep may be of particular importance for cancer patients as it stimulates the proliferation of T cells and NK cells. Unfortunately, cancer patients may experience pain, anxiety, and depression, all of which can interfere with sleep.

Academic stress. Glaser et al. (1993) collected blood samples from 25 Epstein-Barr virus (EBV) seropositive 1st-year medical students, 3 weeks prior to, and at the end of 3 days of medical examinations. During examinations, memory T-cell proliferation decreased significantly for 5 of the 6 EBV polypeptides tested. In a year long study of 40 medical students, Glaser et al. (1987) found numerous immune changes during examination periods: decreases in production of γ-interferon by concanavalin A-stimulated lymphocytes, and T-cell killing by memory T lymphocytes of EBV transformed autologous B lymphocytes; and increases in antibody titers to Epstein-Barr virus (EBV), plasma and intracellular levels of cyclic AMP, and self-reported symptoms suggestive of infectious illness. In an earlier study, Kiecolt-Glaser, et al (1984) found a decrease in NK cell activity that coincided with an increase in psychological distress in medical students (N=75)during exam time.

Personality traits and cancer. There are numerous prospective studies that supply some evidence of an association between certain personality attribute, such as depression or repression of affect, and the risk of having cancer. These studies do not include immunologic data, but are still important to consider as they avoid the methodological difficulties associated with retrospective studies and they involve very large samples.

The Western Electric Health Study (WEHS) was a longitudinal study initiated in 1957 to investigate the epidemiology of coronary heart disease. Subjects (N = 2,020) were males, aged 40 to 55, employed at the Western Electric Company's Hawthorne Works near Chicago (Shekelle et al., 1981). The data gathered in the WEHS provided an opportunity to determine if there is an association between certain psychosocial characteristics and susceptibility to cancer.

In a land mark study, Shekelle et al. (1981) analysed data from the WEHS to examine the relationship between Minnesota Multiphasic Personality Inventory (MMPI) data and cause of death. In the 17 years after the initial assessment, 82 (4%) of the subjects died from cancer. Subjects whose highest score was on the Depression (D) scale at baseline had a twofold increase in odds of death from cancer compared to those whose D scale was not higher than their other scores. Depression was not associated with any other cause of death. There was a positive relationship between depression scores and risk of death from cancer. These results were independent of age, cigarette smoking, alcohol consumption, family history of cancer, and occupational status.

Persky, Kempthorne-Rawson, and Shekelle (1987) used WEHS data to examine the relationship between depression, repression, and incidence as well as mortality from cancer over a 20-year period. The Minnesota Multiphasic Personality Inventory (MMPI) and Cattell's 16 Personality Factor Questionnaire (Form A) provided indicators of depression and repression. During a 20 year long follow up period, 10.5% of the sample (212 men) were diagnosed with cancer. Consistent with the results of Shekelle et al. (1981), the degree of depression, was related to 20-year cancer incidence, $p = .042$, and to 20-year cancer mortality, $p = .024$. Degree of depression was not significantly associated with risk of non-cancer mortality, $p = .222$. Middle aged males with scores on the MMPI depression scale that were higher than their scores on other clinical scales had 1.38 times the risk of being diagnosed with cancer and 1.96 times the risk of dying from cancer, when compared to those with other profiles. There was no significant relationship between repression and incidence or death from cancer.

Grossarth-Maticek, Siegrist, and Vetter (1982) found a positive relationship ($N = 1353$, $r_{pb} = .35$) between an interpersonal communication style characterized as "submissive, non-aggressive, self-derogative and susceptible for repressive cues from dominant persons within affiliative groups" and incidence of cancer (p. 494). Unfortunately, no probability data was presented in this study.

Shaffer, Graves, Swank, and Pearson (1987) examined the relationship between personality characteristics and incidence of cancer in 972 former male medical students over a 30 year period. Data from the Family Attitudes Questionnaire, Rorschach Test, and the Habits of Nervous Tension Questionnaire, were used to group subjects into 5 categories: Bland-Normal, Healthy-Sensitive, Acting Out-Emotional, Loner, and Interpersonal Conflicts. The Acting Out-Emotional group had the lowest incidence of cancer, with less than 1% of these individuals developing cancer. Compared to the Acting Out-Emotional group, members of the Bland-Normal group were 5 times more likely to develop cancer. The Interpersonal Conflicts, Healthy-Sensitive, and Loner groups were, respectively, 10, 14, and 16 times more likely to have cancer than the Acting Out-Emotional group.

From a PNI perspective, the studies relating depression to cancer are consistent with the research documenting the relationship between emotional states and immune suppression. Considering that Irwin et al. (1994) found a decrease in NK cell activity with late night sleep deprivation, I wonder if there are particular sleeping patterns associated with "cancer prone" personalities. It is also interesting to contrast the personality characteristics that relate to an increased risk of cancer to the personality characteristics that Siegel (1986) associates with a "survivor personality". The exceptional cancer patient does not tend to be a loner, repress needs and feelings, or be chronically depressed. Rather, they reportedly become involved, learn to receive and express love, and have hope. The therapist that understands the relationship between emotions and immunity and remembers that Siegel has found that the "survivor personality" can be taught, may be inspired to help their clients make the changes in emotions, personality, and lifestyle that may make the difference between death and recovery.

Interventions

Psychological interventions come in many forms under a variety of titles. There is a certain degree of overlap between the approaches and any division between them is at

least partially artificial. For example, imagery and hypnosis each have their own advocates, professional organizations, journals, and conferences. Yet, they both involve a focusing of conscious attention and the involvement of the senses in creating a condition that facilitates healing. Relaxation is often considered a therapy in its own right, yet it may occur with imagery or hypnosis whether or not it was specifically induced.

While relaxation has been associated with certain changes in the immune system, it cannot be used to target specific desired immune changes. The only psychological or behavioral interventions that have demonstrated this ability are conditioning, hypnosis, and imagery.

Conditioning

Animal Studies

It is possible to condition the immune system to respond in a desired way through either classical conditioning, involving many pairings of the conditioned stimulus with the unconditioned stimulus, or a single pairing, referred to as "one-trial association learning" (Spector, 1987). In numerous animal studies, conditioned immunosuppression and conditioned enhancement of immunologic reactivity has been documented as early as the 1920's. Only brief mention of a few conditioning studies is possible here. See Spector (1987) for an overview of the early history of these conditioning studies, and Ader and Cohen (1991) for a thorough review of the recent research.

The fact that various immune system changes resulting from pharmacological agents, biological agents, or stress, can be conditioned to sensory input such as smell and taste is considered to be strong evidence of the connection between the nervous and immune systems. In a landmark animal study, Ader and Cohen (1975) conditioned the effect of the immunosuppressive drug cyclophosphamide (CY) (suppression of antibody responses to an antigen) to saccharine-flavored water in a single conditioning trial. In a subsequent study, Ader and Cohen (1982) again paired saccharine- flavored water with CY and then used the water as part of a treatment regimen with disease prone mice.

Instead of administering CY weekly to delay the onset of disease, it was possible to give CY every second week, administering the flavored water on alternate weeks. Thus, the onset of disease was delayed while using only half the amount of the toxic CY. In a well controlled animal study, using nine consecutive pairings, Spector (1987) successfully conditioned an increase in natural killer (NK) cell activity to the smell of camphor. This conditioned response reportedly was observed in every animal in the conditioned group. While most of the conditioning studies utilize pharmacological or biological agents to stimulate immune suppression or enhancement, there is evidence that immunosuppression occurring under conditions of stress can also be conditioned as demonstrated in a study using electric footshock as the stressor (Lysle, Cunnick, Fowler, & Rabin, 1988).

Clinical Application of Conditioning

Although primarily demonstrated in animal models, there is evidence that the human immune system can be also be conditioned. Olness (1993) had a patient with severe lupus who was required to take CY, which is very toxic and has severe side effects. Olness attempted to condition the patient's immune system to react as if it was receiving CY, when it in fact was not. After pairing CY with a rose scented perfume and the taste of cod liver oil 3 times (conditioned stimuli), the stimuli were given alone and the patient's body reacted as if she were still receiving the drug. By using the conditioned stimuli on a regular basis, the total amount of the drug given was reduced while still achieving the desired effects. Unfortunately, after a year, the patient could no longer tolerate the taste of cod liver oil. Cod liver oil was used because Olness was following the approach used in the majority of the animal conditioning studies: a standardized taste aversion conditioning paradigm. It appears that the use of an unpleasant tasting substance which caused discomfort in the patient was unnecessary. Ader and Cohen (1991) concluded that there is no support for the notion that conditioned avoidant responses, caused by the aversive tasting substance, are necessary in the conditioning of the immune system.

Spector (1987) calls for the clinical application of conditioning in humans. Spector provides a research protocol for the conditioning of human subjects. Elements of this protocol could be used to guide the clinical application of these conditioning techniques. For example, Spector suggests it is important that the unconditioned stimulus has a known immunologic sequence that is reproducible, causes immunologic changes that are short, and has replicable dosage levels. The conditioned stimulus, which may be an odor, sound, or kinesthetic sensation, must, for example, be easily perceived, immunologically neutral, and novel. Cancer patients, for whom chemotherapy can be very toxic, could potentially benefit from intentional conditioning. It may be possible to decrease the total amount of chemotherapy agents by partially substituting a stimulus which has previously been administered at the same time as the chemotherapy. The effect of such treatment may even be more powerful or resistant to extinction than demonstrated in the animal models due to placebo effects.

Unintentional Conditioning

Considering the repeated demonstration of the ease with which the immune system is conditioned, as evident in the studies using one-trial association, powerful conditioning effects may occur when an individual goes to the hospital with a serious illness or injury. The severe biochemical and immunologic changes occurring in the body are paired with the sights, smells, sounds, and even tastes of the hospital. As a result of conditioning, it is possible that these bodily changes may recur to some degree when the individual is re-exposed to the stimuli of the hospital environment. Unfortunately, little can be done to prevent such accidental conditioning from occurring, or to detect it if it does occur. Olness (1993) suggests that such haphazard conditioning of medication effects with environmental stimuli could pose a risk to the patient.

There is evidence that such unintentional conditioning does occur. Bovjberg et al. (1990) reported that women who had previously received immunosuppressive chemotherapy for cancer had suppressed immune systems simply as a result of arriving at

the hospital prior to their next chemotherapy treatment. It may not even be necessary for the conditioned stimulus to be physically present with the patient. Simply thinking about a conditioned stimulus can result in the release of immunomodulating hormones (Maier, Watkins, & Fleshner, 1994).

Maier et al. (1994) state that the conditioned effects of the drugs used in the treatment of cancer could cause an excessive suppression of a patient's immune system. On the other hand, it is possible conditioning occurs to some degree in all chemotherapy and is unknowingly factored into consideration in the planning of the treatment based upon experience with previous patients. If this is true, a change in the routine of drug administration (for e.g., a change in room, staff, or hospital) could result in the exclusion of the conditioned stimulus, and a change in the immune system that is less than expected or previously demonstrated. Maier et al. suggest that psychologists could play a role in the reduction of conditioning effects by suggesting procedures such as altering the environment that the chemotherapy is received in.

Hypnosis and Imagery

There is a growing body of literature documenting the intentional regulation of the human immune system through the use of hypnosis and imagery. Reviews that may be of interest include: the history of hypnosis and suggestion in healing (Hall, 1986); the use of hypnosis in hospitals (Sunnen, 1988); and the effects of hypnotic suggestion on allergic reactions, dermatologic disorders, warts, mammary glands, burns, bleeding, and bruising (Barber, 1984). For interesting case examples of hypnotic control of physiological functions see Erickson (1977). Numerous reviews on different aspects of imagery and health are found in Sheikh (1984), including one by Hall (1984) who reviews the early research on the use of imagery and relaxation in the treatment of cancer. What follows is a review the relevant PNI research that has utilized these psychological interventions and an examination of some of the techniques used in clinical practice.

Research

Cancer. An innovative approach to the use of imagery was developed in the 1970's that has since gained widespread use. This approach, commonly referred to as the Simonton method, was used to treat 159 cancer patients who received a prognosis of one year to live (Simonton, Mathews-Simonton, & Creighton, 1978). Treatments included progressive relaxation and calm/pleasant imagery, followed by imagery representing effective radiation therapy, and the desired physiological changes in the body that would occur if the cancer was being destroyed. Two years following diagnosis, 63 patients were still alive. While there was new tumor growth in 31.8% of the survivors, complete remission and stabilization of cancer occurred in 22% and 27% of survivors, respectively. While this evidence is compelling, there was no control group or measurements of immune parameters in this study.

Achterberg and Lawlis (1984) developed a psychological instrument called the Image-CA, that evaluates the images cancer patients create about their disease and health. The cancer patient is guided through a standardized relaxation protocol which is followed by instructions to imagine their white blood cells, medical treatment, and cancer. The patient then draws the images and is asked questions about their drawings based on a structured interview. Using a 5-point scale, the drawings and interviews are evaluated on 14 dimensions which include a comparison of the vividness, activity, strength, and numbers of cancer cells vs. white blood cells. Higher scores were given in the white blood cell and treatment categories when they were represented by images that were vivid, active, strong, effective, and numerous. Similarly, high scores were given when the cancer was represented as weak, and few in number. Symbolic imagery received higher scores than realistic imagery.

In two normative studies (Achterberg & Lawlis, 1984), the Image-CA was administered to 79 patients with metastasized cancer. Each of the patients had an estimated 5% chance of surviving 5 years. Based on a two-month follow up, scores

obtained on the Image-CA were predictive of prognosis. High scores predicted favorable prognosis (regression or no disease) 93% of the time, and low scores were 100% predictive of unfavorable prognosis (new cancer growth or death). Scores in the middle range did not reliably predict prognosis. Despite the short follow up in the normative studies, Image-CA appears to be a useful instrument in both evaluating the effectiveness of a cancer patient's imagery in fighting the disease, and in predicting the course of the cancer. It may follow that a patient's prognosis can be improved by changing their imagery to be more like the imagery of patients that recover from their disease. Similar psychological instruments have been developed for spinal pain and diabetes mellitus (Achterberg & Lawlis).

Warts. Warts are caused by various viruses that apparently may be susceptible to mind modulated immune system changes. Spanos, Williams, and Gwynn (1990) found that subjects who received treatment with hypnotic suggestions and imagery of wart regression had significantly more wart regression than those who received a common topical treatment (salicylic acid), a placebo topical treatment, or no treatment. Case studies of the hypnotic treatment of warts include Rowe (1982), and Tasini and Hackett (1977). Numerous folk medicine techniques of wart removal, such as rubbing the wart with a potato which is then buried, might suggest the role of expectancy in wart regression (Steele, 1990). However, Spanos, Stenstrom, and Johnston (1988) found that expectations of the efficacy of treatment were not significantly related to wart regression. Barber (1984) provides a thorough review of the clinical and experimental use of hypnosis in the treatment of warts.

Natural killer cells. In 10 healthy subjects, Zachariae et al. (1990) found a significant increase in NK cell function following a combination of relaxation and imagery of various immune cells compared to change in NK cell function following a control condition (relaxation imagery alone), $p < .05$.

Delayed hypersensitivity reactions. Smith, McKenzie, Marmer, and Steele (1985) conducted a single case study involving the voluntary modulation of a delayed hypersensitivity reaction to Varicella zoster. Utilizing a single-case design, a female subject experienced in meditation was instructed to inhibit her reaction to the antigen during a 3 week period using any psychological method she desired. Five minutes of her daily meditation were devoted to this task. She would visualize the area of the reaction getting smaller and smaller and "she would pass her hand over her arm, sending 'healing energy' to the injection site" (Smith et al., p. 2111). This experimental phase was preceded and followed by a 3 week period to establish the baseline and withdrawal phases of the study. Over the 9 week study she was challenged by injection of Varicella zoster weekly. Her immune reaction was assessed by size of induration and lymphocyte stimulation obtained through blood samples. The subject was able to voluntarily reduce her delayed hypersensitivity reaction in both skin and blood measures during the experimental phase ($p < .001$). The experiment was successfully reproduced with the same subject nine months later.

The results of other studies have been conflicting. In two studies, Smith et al. (1992) found significant changes in skin responses to Varicella zoster, $p < .05$, but no statistically significant changes in lymphocyte stimulation, following hypnosis and imagery of altered immune response. In a controlled study, Locke et al. (1987) were unsuccessful in their attempt to use hypnotic suggestions of either suppressed or enhanced immune response to influence delayed-type hypersensitivity reactions to various antigens (skin challenges).

Immunoglobulins. Caution must be used when reviewing studies using secretory immunoglobulin A (sIgA). Methodological problems resulting from inadequate control for flow rate during sIgA sampling may make data uninterpretable (Stone, Cox, Valdimarsdottir, & Neale, 1987). Kiecolt-Glaser and Glaser (1992) excluded from their

PNI literature review those studies measuring sIgA which did not adequately control for flow rate.

The study by Olness, Culbert, and Uden (1989) is frequently cited as providing strong evidence of voluntary immunomodulation. They apparently do not control for flow rate, although they provide an explanation why differences in flow rate would not have invalidated their data. Children ($\underline{N}$ = 57) between the ages 6 and 12 were randomly assigned to 3 groups. In the first of two visits, children provided a saliva sample (baseline) then watched a videotape that provided an age appropriate explanation of the immune system. During the second visit two weeks later a second saliva sample was obtained, and treatments were administered, followed by a third saliva sample (35 minutes after the second sample). Groups A and B listened to a self-hypnosis tape for 25 minutes between the 2nd and 3rd saliva samples. During the period of self-hypnosis group A received a "nonspecific suggestion that they might increase immune substances in their saliva" and group B received "specific suggestions about increasing salivary immunoglobulins" (Olness et al., p. 67). Group C, the control, conversed for the 25 minute "treatment" period. Group B demonstrated a statistically significant increase in sIgA between samples 2 and 3, $\underline{p}$ = .007. While the authors remain non committal regarding possible relaxation effects upon sIgA, it is unlikely that relaxation effects accounted for the increase in sIgA. The degree of relaxation experienced by group A and B should have been equivalent (they listened to the same self-hypnosis script), yet there was no significant increase in sIgA in group A. It is possible that the degree of relaxation experienced in all groups was relatively slight since there were no significant changes in peripheral temperature in any of the groups. There were no significant differences between the groups on the Stanford Children's Hypnotic Susceptibility Scales, nor was there any association between hypnotic susceptibility scores and sIgA change within group B.

Rider and Weldin (1990) randomly selected and assigned 30 university students to 3 groups: imagery/music, music, and control. The imagery/music group received a 5

minute lecture on antibodies, then was instructed to imagine antibody production while listening to 10 minutes of live improvised soothing music to facilitate relaxation and imagery. The music group was instructed to be aware of any feelings or imagery that developed while listening to the music, and the control group sat in silence for 10 minutes. Saliva was collected before and after the 10 minute treatment period, controlling for circadian variations by conducting testing at the same time of day. Increase in sIgA levels was significantly greater in the imagery/music group than in the music or control groups, $p < .0001$. Mean changes in sIgA for the imagery/music, music, and control groups were, respectively, 30.72, 6.45, and -1.23. Rider and Weldin do not mention any attempt to control for flow rate in this study.

Neutrophils. Neutrophils are polymorphonuclear granulocytes which constitute over 70% of all leucocytes (white blood cells) (Male, 1991). While neutrophils protect the body against infection through phagocytosis and the release of granule proteins, they are also related to the pathology of several diseases such as rheumatoid arthritis (Venge, 1993). Neutrophil adhesion to vascular endothelial cells is necessary for the neutrophil to migrate across the endothelium (wall of the blood vessel) and accumulate at extravascular sites of infection and/or inflammation (Godin, Caprani, Dufaux. & Flaud, 1993) A method of intentionally altering the adherence of neutrophils and other related cells (e.g., eosinophils involved in asthma) could be an important adjunct treatment of several disabling and life-threatening diseases.

Rider and Achterberg (1989), randomly assigned 30 subjects to two experimental groups, each of which had the task of using imagery to enhance either lymphocytes or neutrophils. In two initial sessions the subjects were provided with information on the morphology and location of lymphocytes or neutrophils, and assisted in the development of imagery representative of the assigned task. Over six weeks the subjects were instructed to practice the imagery at home with the assistance of an audio taped Jacobson progressive muscle relaxation protocol. At the end of the six week training period,

peripheral blood samples were taken before and after a final 20 minute imagery session. Based on previous biofeedback and imagery studies, Rider and Achterberg hypothesized that the cell specific imagery would result in decreased counts of either lymphocytes or neutrophils in peripheral blood possibly as a result of increased cell migration out of the blood stream. Rider and Achterberg reported significant decreases in neutrophils, but not lymphocytes, in the group imagining changes in neutrophils. Lymphocytes, but not neutrophils, decreased significantly in the group imagining changes in lymphocytes. Thus, there was a selective response to the cell specific imagery.

Several controlled studies provide strong evidence that the use of imagery representing changes in neutrophil adhesiveness may result in short-term measurable changes of adhesiveness, although not always in the direction intended. Hall, Minnes, Tosi and Olness (1992), assigned 45 subjects to 3 groups. The control group (group A) was instructed merely to rest with their eyes closed while remaining awake for a 30 minute period. Peripheral blood samples were taken before and after the 30 minute resting period providing a control for the stability of the measure of neutrophil adherence. There was no change in adherence over the 30 minute period. The control subjects were then instructed to practice resting daily for one week prior to returning for a final 30 minute resting period. Pre- and post-resting measures indicated no significant change in neutrophil adherence in this second session. An experimental group (group B) was given information about neutrophils and asked to think of an image to represent increased adherence. Following a guided relaxation protocol, group B subjects were asked to concentrate on the image they created. In this first session there was a significant pre-to-post decline in neutrophil adherence during the 30 minute intervention, $t = -2.859$, $p = .01$. In the second session, after one week of daily practice relaxing and imaging, there was a clear but not significant decrease in adherence. A second experimental group (group C) was given 2 weeks (4 sessions) of training in relaxation and imagery (focused on decreasing salivary IgA) prior to following the protocol used for group B. In the first session following the

extra 2 weeks of training, group C had a decrease in adherence. In session 2, there was and increase in adherence in group C that was significantly different than changes observed in the other groups. In summary, contrary to expectations, the neutrophil adherence decreased in both sessions for group B and session 1 for group C, yet increased in session 2 for group C. There were no significant changes in chemiluminescence, neutrophil count, monocyte count, platelet count, white blood count, or salivary IgA. Changes in neutrophil adherence was not associated with high hypnotic ability. There was no relationship between pulse rate or temperature (indicators of relaxation) and changes in neutrophil adherence (Hall et al., 1993).

Hall et al. (1992) proposed that the effects opposite to those intended may have been due to a learning curve sometimes seen in self-regulation training. However, a recent study (Hall, Papas, Tosi, & Olness, 1995) provided evidence which suggests that the intentional changes in neutrophil adherence may be related to the process of the intervention rather than specific imagery, in as much as decreased neutrophil adherence was related to "active-imaging", while increased adherence was related to "passive-resting". This study had 3 groups, a control group (group A, $\underline{n} = 8$) which rested with eyes closed, and two experimental groups. One experimental group (group B, $\underline{n} = 4$) was instructed to create imagery representing increased neutrophil adherence, and one (group C, $\underline{n} = 3$) created imagery representing decreased neutrophil adherence. All groups received rudimentary instruction in the functioning of the immune system, and had two weeks of practice and training (4 sessions in 2 weeks) prior to session 1, and session 2, two weeks later. Both active-imagery groups had clear pre-to-post decreases in adherence, regardless of the intended direction of the imagery. A $\underline{t}$ test indicated the decrease for group B was significant, $\underline{p} = .014$. The sample size for group C was reportedly too small to establish significance. A clear increase in adherence was evident for group A (passive-resting). All groups showed statistically significant differences in adherence on the Omni $\underline{f}$ test. Thus, the decreased adherence in the active-imagery groups

is consistent with the decreases seen in Hall et al. (1992) (session 1 and 2 for group B, and session 1 for group C). Dr. Hall (personal communication, May 15, 1995) stated that the increase in adherence seen in session 2 for group C of the 1992 study may have been the result of the relaxation component taking effect (3 weeks of relaxation training by that point).

Hypnotherapy Methods

Hypnotic suggestions. Traditional hypnosis frequently involves the therapist providing, in an authoritarian manner, suggestions of desired changes. Although numerous studies utilize the approach, simply suggesting changes in the immune system may be overly simplistic. In a controlled study, Locke et al. (1987) were unsuccessful in their attempt to use hypnotic suggestions of either suppressed or enhanced immune response to influence delayed-type hypersensitivity reactions to various antigens (skin challenges). Some subjects, possibly those who are highly hypnotizable, may report experiencing physiological changes when in fact none occur (Hall, 1990).

Ideomotor signaling. The ideomotor method of facilitating the mind-body healing process evolved from the hypnotic phenomena of ideomotor movements. The term ideodynamic represents the connection between ideas and the resulting physiological changes that occur in the body. Essentially, recognizable physical movements in the body, such as the raising of a finger or the movement of a head, can be the end result of unconscious mental processes. Specific movements develop in response to questions that can be answered with simple responses such as "yes", "no", or "I do not wish to answer".

One use of ideodynamic methods in hypnosis is based on the idea that the biological changes in the body at times of stress, such as the release of hormones, are encoded into state-dependent memory. The memories of the stressful or traumatic events are often difficult to consciously recall and may be expressed as psychosomatic symptoms or diseases (Rossi, 1993). Rossi hypothesizes that the process of reviewing traumatic events under hypnosis with the aid of ideomotor signals involves the reactivation of the

same pattern of information substances that were present under the original stress. Ideomotor signals facilitate the accessing of the state-dependent memories that are not available to the conscious mind, and as such are not readily accessible with traditional talking therapies.

Using ideomotor signals to access state-dependent memories involves: (a) establishing the ideomotor signals, (b) asking the unconscious questions that systematically take the person from their current age to their age when the event occurred, (c) allowing the event to enter conscious awareness so it can be verbalized, and (d) ratify the potential therapeutic gains by asking if any more work needs to be done, and when the problem will be completely resolved. Following the conscious expression of the trauma, the therapist assists the client in reframing the meaning of the event. For protocols utilizing ideomotor signals to access state-dependent memory, see Madrid and Barnes (1991), and Rossi (1993).

While the above ideodynamic approach does not target specific immune system changes, ideomotor signals could be used to target specific immune changes by asking the unconscious to make the desired changes and to provide indication from the unconscious if the changes did indeed occur. Rossi and Cheek (1988) provide numerous case examples and a hypnotic protocol of this approach used to control bleeding and other physiological processes. For example, after establishing ideomotor signals, the therapist might say: "Your inner healing source can let this finger lift when the bleeding (and/or pain, etc.) has been turned down by half" (Rossi & Cheek, p. 187).

Imagery Methods

Imagery vs. visualization. The terms "imagery" and "visualization" are not interchangeable. Visualization refers solely to the sense of sight. Imagery may incorporate visualization but it is not limited to it. Sounds, tastes, smells, and feelings may also be involved. Not only is it incorrect to interchange the terms, doing so may frustrate clients because some individuals do not have a well developed capacity for visual imagery.

While I support the use of the above definition, agreement on the meaning of the terms is not universal. Norris (1989) uses the term "visualization" to refer to mental representations that are consciously created. "Imagery", in contrast, is used to refer to mental representations that occur spontaneously from the level of the unconscious.

Importance of client's imagery. Imagery does not occur only in a therapy session. Every time a person focuses inward to a thought, memory, sensation, or dream, imagery is involved. When a patient worries about the course of their disease, they are likely imagining a decline in their health, or worse. Rossman emphasizes the significance of the images formed by a patient when they worry, or when they are given a diagnosis and prognosis of a disease. The images, which may not be an accurate representation of the situation, may act as a form of autosuggestion, contributing to the course of the disease (Rossman, 1984). Support for this hypothesis is provided by the research of Achterberg and Lawlis (1984) using the Image-CA. Based on clinical experience, Siegel (1986) routinely has his patients draw their imagery and finds that the drawings are a useful aid in assessing the patient's prognosis.

Techniques. The PNI studies that use imagery typically follow the same treatment format: a period of relaxation, either progressive relaxation or hypnotically induced relaxation, followed by imagery representing the desired changes. Hall (1990) provides a script that combines progressive relaxation and hypnotic deepening techniques. While the script provides basic imagery for up-regulating the immune system, it is easily adaptable to other purposes.

Achterberg, Dossey, and Kolkmeier (1994) provide a helpful and thorough guide to the use of imagery for both the therapist and patient. The material is partly based on a wide range of literature, research using the Image-CA (Achterberg and Lawlis, 1984), and clinical experience. A step-by-step approach to developing a personalized treatment plan is facilitated with the presentation of numerous scripts and case studies to follow as examples. Achterberg et al. emphasize the importance of the ritualistic elements of the

psychological treatment, as it is a healing ritual possessing commonalities with both ancient and modern medical treatment. A treatment plan reportedly should include (a) finding a place of quiet and healing, (b) inner dialogue and reflection about the disease and relevant spiritual issues, (c) social support, (d) self-love, (e) assessment of personal belief system, (f) education about the disease process, various treatments, and changes necessary to achieve a state of health, (g) taking steps to gain a degree of personal control over medical treatments, (h) development of powerful, symbolic imagery representing effective treatment and the bodily changes involved in healing, (i) learning and practicing relaxation and breathing skills, and (j) integration and frequent practice of relaxation, breathing, and imagery. There are numerous similarities between this treatment plan and the characteristics of the exceptional cancer patient presented by Siegel (1986).

Based on clinical experience, Dr. Rossman (1984) and a colleague, Dr. Remen, have developed a structured relaxation and imagery program called "Imagine Health!" that involves: (a) relaxation skills, (b) development of, and dialogue with, imagery representing a "inner advisor", (c) establishment of a dialogue with imagery that represents the problem or symptom with the intention of gaining insight into the genesis of the problem and what is needed to resolve it, and (d) development and implementation of a plan of action to make the changes necessary to move towards greater health.

It is apparently important that the imagery is accurate in terms of the process represented. When working with a cancer patient, for example, the white blood cells should be imagined as more numerous, powerful, and vivid than the cancer cells. Simonton et al. (1978) have found that the imagery tends to be more effective if it has all of the following features: (a) tumor cells are weak, confused, and physically vulnerable, (b) treatment is more powerful than the cancer cells, (c) large numbers of white blood cells compared to the tumor cells, (d) white blood cells are eager and aggressive in fighting the disease, (e) natural disposal of the defeated cancer cells, (f) recovery of healthy tissues

effected by medical treatments such as radiation, (g) the desired state of being disease free and healthy, (g) achievement of life goals.

"How often?" is an important question when dealing with a self-directed treatment such as the home practice of imagery. Practitioners utilizing imagery in clinical practice report that frequent practice appears to be related to successful treatment (Rossman, 1984). If the condition is life threatening it may be beneficial to practice the healing ritual two or three times daily, as well as briefly evoking the imagery numerous times per day (Achterberg et al., 1994). Frequent daily practice facilitates a repeated focusing on positive expectancy, repeated muscular and mental relaxation, and numerous "doses" of the immunomodulating imagery.

Related Issues

Ultradian rhythms. Rossi's theory based on ultradian rhythms has been repeatedly published and updated. See Rossi (1994) for the most recent summary of the theory, and Rossi (1991) for methods of using the theory to facilitating healing. While working with Milton Erickson, Dr. Rossi discovered a similarity between the physiological and psychological changes indicating the development of trance, and the changes occurring in the low phase of the cycle of ultradian rhythms. Out of this observation, Rossi has theorized that the 20 minute transition phase between cyclings of ultradian rhythms, which occur every 90 to 120 minutes, is the period in which humans experience the "common everyday trance". This period is characterized, in part, by increased suggestibility, occurrence of classical hypnotic phenomena, sleepiness, and daydreaming. Psychosomatic disorders are theorized to develop as a result of disruption of these natural rhythms. This disruption is caused by a failure to take the breaks necessary to allow recovery before the next activity phase. Faced by the increasing demands of modern life, few of us take the breaks necessary for completed recovery.

The 20-minute rest and recovery phase is called the Ultradian Healing Response. It is nature's way of ensuring healing and a homeostatic balance. Disease processes related

to the stress of ignoring the healing phases can be treated by facilitating the Ultradian Healing Response. Essentially, this means taking breaks of approximately 20 minutes duration when the body signals the beginning of the 20 minute cycle. Daydreaming, stretching, and decreased work performance are a few of the signals of this transition. Rossi (1993) notes that a common element to most of the research on holistic approaches is a 20 minute period of treatment. Rossi speculates that many mind-body healing techniques unintentionally and unknowingly facilitate the Ultradian Healing Response. It is possible the actual mechanism of healing may not be the specific treatment, but rather the facilitation of the Ultradian Healing Response.

Hypnotic susceptibility. Consistent with the traditional model of hypnosis, hypnotic susceptibility scales focus on an individual's response to suggestion. Conflicting results have come from numerous studies that have measured the hypnotic susceptibility of their subject in an attempt to determine if subjects with a high degree of hypnotic ability are better able to voluntarily regulate their immune system. The use of different treatment techniques complicate comparisons between the studies. Some studies have utilized suggestions of immune changes while the subject was in a state of hypnosis, while others use relaxation assisted imagery. Athough highly hypnotic susceptible individuals may be more proficient at relaxation and imagery, there is a lack of evidence for a hypnotic susceptibility-immunomodulation link (Hall, 1989)

The usefulness and validity of the concept of hypnotic susceptibility and the use of susceptibility scales is debated by a number of very prominent individuals in the field of hypnosis. Yapko (1990) discusses some of the flaws in studies of hypnotizability and asserts that hypnotic susceptibility scores are obtained in circumstances that are unlike a clinical situation, and do not reflect actual capacity for hypnosis.

Hypnotic suggestions may not be as important as many traditionally trained hypnotherapists believe. Suggestion is an unessential component of hypnosis (Rossi,

(1989). Experimentally measured hypnotic susceptibility is not necessarily equivalent to therapeutic hypnosis (Rossi & Cheek, 1988).

Hypnotic susceptibility scores may, to some degree, indicate what stage of ultradian rhythm an individual is in, rather than an innate susceptibility. High scores may reflect the 15-to-20 minute period of the common everyday trance or Ultradian Healing Response. During the Ultradian Healing Response there is heightened suggestibility and spontaneous occurrences of hypnotic phenomena (Rossi, 1991, p. 180). Rossi (1994) reviews the current data that supports this hypothesized relationship.

One of the limitations of the standardized hypnotizability scales is that it is not possible to standardize confidence and motivation. In clinical practice, the skill and confidence of the therapist, and the motivation of the client can greatly influence the likelihood of inducing trance (Rossi & Cheek, 1988).

Belief. Belief may play a role in the efficacy of treatment. From the perspective of Achterberg et al (1994) belief is important in all healing. Although the differences in semantics may not be clear, Norris (1989) emphasizes the important of how one feels about a treatment: "It is not a question of believing, or thinking, or feeling, or hypothesizing, that visualizations can effect healing, but of knowing, from the inside that this is true" (p. 62). Expectancy and placebo, essentially synonyms for belief, are one of four factors central to all forms of psychotherapy that are related to positive outcomes (Miller, Hubble, & Duncan, 1995). The remaining factors include: therapeutic relationship, therapeutic technique, and client factors.

Conclusions

Psychologists who use conditioning, hypnosis, and imagery, in the treatment of physical disease, are likely to have some degree of confidence in the effectiveness of such techniques. Unfortunately, traditional medicine tends to have little interest in these interventions, possibly because of the lack of a comprehensive theory (Schwartz,1984). PNI research provides the basis for developing that comprehensive theory (Solomon,

1993). Well designed studies that involve biological measures of immune function are crucial if psychologists are to refine their techniques and establish credibility in the medical and scientific community.

Research in the field of PNI can be complex, requiring the expertise of psychologists, physicians, immunologists, and molecular biologists. This complexity functions as a catalyst, bringing together knowledge which when combined allows for an integrated understanding of how the mind and body function.

Psychologists can play an important role in the field of PNI. In research, psychologists have unique training in assessing psychological and behavioral variables (Geiser, 1989). In clinical practice, psychologists have the responsibility of applying the methods refined, or at least supported, through research, and of developing new methods through clinical experience. Psychologists also have the responsibility of humility and caution in promoting the use of psychological interventions. It is crucial to avoid exaggerating the benefits of PNI interventions. To do otherwise may bring scorn and criticism from the scientific community and disappointment from the public.

Hopefully this review will provide a taste of the wealth of research from the many disciplines that come together under the title "psychoneuroimmunology". There is strong evidence that the mind can influence the human immune system. How it happens, and how to utilize it more effectively can only be discovered through further research and educated clinical practice.

References

Achterberg, J., Dossey, B., & Kolkkmeier, L. (1994). Rituals of healing: Using imagery for health and wellness. Ny: Bantam

Achterberg, J., & Lawlis, G. F. (1984). Imagery and disease: Image-CA, Image-SP, Image-DB: A diagnostic tool for behavioral medicine. Champaign, IL: Institute for Personality and Ability Testing.

Ader, R., & Cohen, N. (1975). Behaviorally conditioned immunosuppression. Psychosomatic Medicine, 37, 333-340.

Ader, R., & Cohen, N. (1982). Behaviorally conditioned immunosuppression and murine systemic lupus erythematosus. Science, 215, 1534-1536.

Ader, R., & Cohen, N. (1991). The influence of conditioning on immune responses. In R. Ader, D. L. Felton, & N. Cohen (Eds.), Psychoneuroimmunology (pp.611-646). New York: Academic Press.

Ader, R., Cohen, N., & Felten, D. (1995). Psychoneuroimmunology: interactions between the nervous system and the immune system. The Lancet, 345, 99-103

Antoni, M. H. (1987). Neuroendocrine influences in psychoimmune and neoplasia: A review. Psychology and Health, 1, 3-24.

Barber, T. X. (1984). Changing "unchangeable" bodily processes by (hypnotic) suggestions: A New Look at Hypnosis, Cognitions, Imagining, and the Mind-Body Problem. Advances, 1(2), 7-40.

Bateman, A., Singh, A., Kral, T., & Solomon, S. (1989). The immune-hypothalamic-pituitary-adrenal axis. Endocrine Reviews, 10(1), 92-112.

Bovjberg, D. H., Redd, W. H., Maier, L. A., Holland, J. C., Lesko, L. M., Niedzwiecki, D., Rubin, S. E., & Hakes, T. B. (1990). Anticipatory immune suppression in women receiving cyclic chemotherapy or ovarian cancer. Journal of Consulting and Clinical Psychology, 58, 153-157.

Cohen, N., Ader, R., & Felton, D. L. (1994). Psychoneuroimmunology. In L. H. Sigal, & Y. Ron (Eds.), Immunology and Inflammation: Basic Mechanisms and Clinical Consequences (pp. 465-494). New York: McGraw-Hill.

Erickson, M. H. (1977). Control of physiological functions by hypnosis. The American Journal of Clinical Hypnosis, 20(1), 8-19.

Futterman, A. D., Kemeny, M. E., Shapiro, D., & Fahey, J. L. (1994). Immunological and physiological changes associated with induced positive and negative mood. Psychosomatic Medicine, 56, 499-511.

Geiser, D. S. (1989). Psychosocial influences on human immunity. Clinical Psychology Review, 9, 689-715.

Glaser, R., Pearson, G. R., Bonneau, R. H., Esterling, B. A., Atkinson, C., & Kiecolt-Glaser, J. K. (1993). Stress and the memory T-cell response to the Epstein-Barr virus in healthy medical students. Health Psychology, 12(6), 435-442.

Glaser, R., Rice, J., Sheridan, J., Fertel, R., Stout, J., Speicher, C., Pinsky, D., Kotur, M., Post, A., Beck, M., Kiecolt-Glaser, J. (1987). Stress-related immune suppression: Health implications. Brain, Behavior, and Immunity, 1, 7-20.

Godin, C., Caprani, A., Dufaux, J., & Flaud, P. (1993) Interactions between neutrophils and endothelial cells. Journal of Cell Science, 106, 441-452.

Gorman, J. M., & Kertzner, R. (1990). Psychoneuroimmunology and HIV infection. Journal of Neuropsychiatry, 2(3), 241-52.

Grossarth-Maticek, R., Siegrist, J., & Vetter, H. (1982) Interpersonal repression as a predictor of cancer. Social Science and Medicine, 16, 493-498.

Hall, H. (1984). Imagery and Cancer. In A. A. Sheikh (Ed.), Imagination and Healing (pp. 159-169). Farmingdale, N. Y.: Baywood.

Hall, H. (1986). Hypnosis, suggestion, and the psychology of healing: A historical perspective. Advances, 3(2), 29-37.

Hall, H. R. (1989). Research in the area of voluntary immunomodulation: Complexities, consistencies and future research considerations. International Journal of Neuroscience, 47, 81-89.

Hall, H. (1990). Imagery, psychoneuroimmunology, and the psychology of healing. In R. G. Kunzendorf & A. A. Sheikh (Eds.), The Psychophysiology of Mental Imagery: Theory, Research and Application (pp.203-227). Amityville, NY: Baywood.

Hall, H., Minnes, L., & Olness, K. (1993). The psychophysiology of voluntary immunomodulation. International Journal of Neuroscience, 69, 221-234.

Hall, H., Minnes, L., Tosi, M., & Olness, K. (1992). Voluntary modulation of neutrophil adhesiveness using a cyberphysiologic strategy. International Journal of Neuroscience, 63, 287-297.

Hall, H., Papas, A., Tosi, M., & Olness, K. (1995). Directional changes in neutrophil adherence following passive-resting vs. active-imaging. (submitted).

Hall, N. R. S., O'Grady, M. P. (1991). Psychosocial interventions and immune function. In R. Ader, D. L. Felton, & N. Cohen (Eds.), Psychoneuroimmunology (pp.1067-1080). New York: Academic Press.

Irwin, M., Mascovich, A., Gillin, C., Willoughby, R., Pike, J., & Smith, T. L. (1994). Partial sleep deprivation reduces natural killer cell activity in humans. Psychosomatic Medicine, 56, 493-498.

Jankovic, B. D. (1991). Neuro-immune network: Basic structural and functional correlates. Acta-Neurologica, 13(4), 305-314.

Kiecolt-Glaser, J. K., Garner, W., Speicher, C., Penn, G. M., Holliday, J., & Glaser, R. (1984). Psychosocial modifiers of immunocompetence in medical students. Psychosomatic Medicine, 46, 7-14.

Kiecolt-Glaser, J.K., & Glaser, R. (1991). Stress and immune function in humans. In R. Ader, D. L. Felton, & N. Cohen (Eds.), Psychoneuroimmunology (pp.849-867). New York: Academic Press.

Kiecolt-Glaser, J.K., & Glaser, R. (1992). Psychoneuroimmunology: Can psychological interventions modulate immunity? Journal of Consulting and Clinical Psychology, 60(4), 569-575.

Kiecolt-Glaser, J. K, Glaser, R., Williger, D., Stout, J., Messick, G., Sheppard, S., Ricker, D., Romisher, S. C., Briner, W., Bonnell, G., & Donnerberg, R. (1985). Psychosocial enhancement of immunocompetence in a geriatric population. Health Psychology, 4(1), 25-41.

Levy, S., Herberman, R., Lippman, M., & d'Angelo, T. (1987). Correlation of stress factors with sustained depression of natural killer cell activity and predicted prognosis in patients with breast cancer. Journal of Clinical Oncology, 5(3), 348-353.

Locke, S. E., Ransil, B. J., Covino, N. A., Toczydlowski, J., Lohse, C. M., Dvorak, H. F., Arndt, K. A., & Frankel, F. H. (1987). Failure of hypnotic suggestion to alter immune response to delayed-type hypersensitivity antigens. Annals of the New York Academy of Sciences, 496, 745-749.

Lysle, D. T., Cunnick, J. E., Fowler, H., & Rabin, B. (1988). Pavlovian conditioning of shock-induced suppression of lymphocyte reactivity: Aquisition, extinction, and preexposure effects. Life Sciences, 42, 2185-2194.

Madrid, A. D., & Barnes, S. v.d.H. (1991). A hypnotic protocol for eliciting physical changes through suggestions of biochemical responses. American Journal of Clinical Hypnosis, 34(2), 122-128.

Maier, S. F., Watkins, L. R., & Fleshner, M. (1994). Psychoneuroimmunology: The interface between behavior, brain, and immunity. American Psychologist, 49(12), 1004-1017.

Male, D. (1991) Immunology: An illustrated outline. Ny: Gower

Miller, S., Hubble, M., & Duncan, B. (1995). No more bells and whistles. Family Therapist Networker.

Norris, P. A. (1989). Clinical psychoneuroimmunology: Strategies for self-regulation of immune system responding. In J. V. Basmajian (Ed.), Biofeedback Principles and Practice for Clinicians (3rd ed.) (pp. 57-66). Baltimore, MD: Williams & Wilkins.

O'Donnell, M., Silove, D., & Wakefield., D. (1988). Current perspectives on immunology and psychiatry. Australian and New Zealand Journal of Psychiatry, 22, 366-382.

Olness, K. (1993). Self regulation and conditioning. In B. Moyers (Ed.), Healing and the mind (pp. 71-85). New York: Doubleday.

Olness, K., Culbert, T., & Uden, D. (1989). Self regulation of salivary immunoglobulin A by children. Pediatrics, 83(1), 66-71.

Persky, V. W., Kempthorne-Rawson, J., & Shekelle, R. B. (1987) Personality and risk of cancer: 20-year follow-up of the Western Electric Study. Psychosomatic Medicine, 49, 435-449.

Rider, M. S., & Achterberg,. J. A. (1989). Effects of Music-Assisted Imagery on Neutrophils and Lymphocytes. Biofeedback and Self-Regulation, 14(3), 247-57.

Rider, M. S., & Weldin, C. (1990). Imagery, improvisation, and immunity. The Arts in Psychotherapy, 17, 211-216.

Rossi, E. L. (1989). Mind-body healing, not suggestion, is the essence of hypnosis. American Journal of Clinical Hypnosis, 32(1), 14-5.

Rossi, E. L. (1991). The 20 minute break: Using the new science of ultradian rhythms. Los Angeles: Tarcher.

Rossi, E. (1993). The Psychobiology of Mind-Body Healing (2nd ed.). New York: Norton.

Rossi, E. (1994). New theories of healing and hypnosis: The emergence of mind-gene communication. European Journal of Clinical Hypnosis, (3), 4-17.

Rossi, E. L., & Cheek, D. B. (1988). Mind-body therapy: Ideodynamic healing in hypnosis. New York: W. W. Norton.

Rossman, M. L. (1984). Imagine Health! Imagery in medical self-care. In A. A. Sheikh (Ed.), Imagination and Healing (pp. 231-258). Farmingdale, N. Y.: Baywood.

Rowe, W. S. G. (1982). Hypnotherapy and plantar warts. Austrailian and New Zealand Journal of Psychiatry, 16, 304.

Schedlowski, M., Jung, C., Schimanski, G., Tewes, U., & Schmoll, H.-J. (1994). Effects of behavioral interventions on plasma cortisol and lymphocytes in breast cancer patients: An exploratory study. Psycho-oncology, 3, 181-187.

Schwartz, G. E. (1984). Psychophysiology of imagery and healing: A systems perspective. In A. A. Sheikh (Ed.), Imagination and Healing (pp. 35-50). Farmingdale, N. Y.: Baywood.

Shaffer, J. W., Graves, P. L., Swank, R. T., & Pearson, T. A. (1987) Clustering of personality traits in youth and the subsequent development of cancer among physicians. Journal of Behavioral Medicine, 10(5), 441-447.

Sheikh, A. A. (Ed.). (1984). Imagination and healing. Farmingdale, NY: Baywood

Shekelle, R. B., Raynor, W.J., Ostfeld, A. M., Garron, D. C., & Bieliauskas, L. A., Liu, S. C., Maliza, C., Ogelsby, P. (1981) Psychological depression and 17 year risk of death from cancer. Psychosomatic Medicine, 43, 117-125.

Siegel, B. S. (1986). Love, medicine & miracles: Lessons learned about self-healing from a surgeon's experience with exceptional patients. New York: Harper & Row.

Simonton, O. C., Matthews-Simonton, S., & Creighton, J. L. (1978). Getting well again: A step-by-step, self-help guide to overcoming cancer for patients and their families. New York: Bantam Books.

Smith, G. R., Conger, C., O'Rourke, D. F., Steele, R. W., Charlton, R. K., & Smith, S. S. (1992). Psychological modulation of the delayed type hypersensitivity skin test. Psychosomatics, 33(4), 444-451.

Smith, G. R., McKenzie, J. M., Marmer, D. J., & Steele, R. W. (1985). Psychologic modulation of the human immune response to varicella zoster. Achives of Internal Medicine, 145, 2110-2112.

Solomon, G. F. (1987). Psychoneuroimmunologic approaches to research on AIDS. Annals of the New York Academy of Sciences, 496, 628-636.

Solomon, G. F. (1993). Whither psychoneuroimmunology? A new era of immunology, of psychosomatic medicine, and of neuroscience. Brain, Behavior, and Immunity, 7, 352-366.

Spanos, N. P., Stenstrom, R. J., & Johnston, J. C. (1988). Hypnosis, placebo, and suggestion in the treatment of warts. Psychosomatic Medicine, 50, 245-260.

Spanos, N. P., Williams, V., & Gwynn, M. I. (1990). Effects of hypnotic, placebo, and salicylic treatments on wart regression. Psychosomatic Medicine, 52, 109-114.

Spector, N. H. (1987). Old and new strategies in the conditioning of immune responses. Annals of the New York Academy of Sciences, 496, 522-531.

Steele, K. (1990). Wart charming practices among patients attending wart clinics. British Journal of General Practice, 40, 517-518.

Stone, A. A., Cox, D. S., Valdimarsdottir, H., & Neale, J. (1987). Secretory IgA as a measure of immunocompetence. Journal of Human Stress, 13, 136-140.

Sunnen, G. V. (1988). Medical hypnosis in the hospital. Advances, 5(2),5-12.

Tasini, M. F., & Hackett, T. P. (1977). Hypnosis in the treatment of warts in immunodeficient children. The American Journal of Clinical Hypnosis, 19(3), 152-154.

Udelman, D.L., & Udelman, H. D. (1991). Affects, neurotransmitters, and immunocompetence. Stress Medicine, 7, 159-162.

Uthgenannt, D., Schoolmann, D., Pietrowsky, R., Fehm, H-L., & Born, J. (1995). Effects of sleep on the production of cytokines in humans. Psychosomatic Medicine, 57, 97-104.

Venge, P. (1993). Eosinophil and neutrophil granulocytes. Allergy, 48, 39-47.

Vollhardt, L. T. (1991). Psychoneuroimmunology: A literature review. American Journal of Orthopsychiatry, 61(1), 35-47.

Yapko, M. D. (1990). Trancework: An introduction to the practice of clinical hypnosis. (2nd ed.). New York: Bruner/Mazel.

Zachariae, R., Kristensin, J. S., Hokland, P., Ellegaard, J., Metze, E., & Hokland, M. (1990). Effect of psychological intervention in the form of relaxation and guided imagery on cellular immune function in normal healthy subjects. Psychotherapy and Psychosomatics, 54(1), 32-39.

Running head: TREATMENT PROTOCOL FOR ASTHMA

Imagery and Asthma:
Development of a Treatment Protocol

Keith E. Zukiwski

University of Alberta

Imagery is an important component of shamanic and other healing rituals used throughout human history (Achterberg, 1985). One modern application of imagery, known as the "Simonton method" has been used as a complementary treatment for cancer and other diseases since its development in 1971 (Simonton, Matthews-Simonton, & Creighton, 1978).

The Simonton method has evolved through years of use in clinical practice. Achterberg, Dossey, and Kolkmeier (1994) present their version of this method in the form of a self-help book that provides instructions on developing your own treatment plan, and contains sample treatment scripts. Numerous variations of the Simonton method can be found in the literature (e.g., Bresler, 1984; Rossman, 1984; Zahourek, 1988),

Regardless of subtle differences between practitioners, the essence of the method is the use of idiosyncratic imagery, involving any or all of the five senses, to imagine desired physiological changes at the structural and cellular level. If the technique is used as a treatment for cancer, the imagery represents the immune system becoming more active and powerful, and the subsequent destruction and removal of the tumor cells (Simonton et al., 1978).

In clinical practice, treatment frequently incorporates a variety of other techniques that include: the drawing of imagery representing the disease, healing resources (e.g., immune system), and medical treatment; and dialogue with the unconscious by imagining an "inner advisor" (Achterberg et al., 1994; Norris, 1989; Rossman, 1984; Siegel, 1986; Simonton et al., 1978). Research with normal subjects has generally limited the experimental condition to the following: education about the desired physiological change, induction by relaxation or hypnosis, and instructions to imagine the desired changes. In normal subjects, compared to controls, imagery has been associated with changes in numbers of neutrophils and lymphocytes (Rider & Achterberg, 1989), and neutrophil adhesion (Hall, Minnes, Tosi, & Olness, 1992; and Hall, Papas, Tosi, & Olness, 1995). Hall et al. (1992) provided their subjects with a basic explanation of what neutrophils are

and how they can decrease or increase adherence. The subjects were then instructed to focus on their idiosyncratic image that represents increased adherence.

Currently, I am not aware of any studies that incorporate imagery representing a decrease in the inflammatory process as a treatment for asthma. Considering the results of the neutrophil studies (e.g., Hall et al., 1992), imagery representing decreased adhesion of eosinophils and other leukocytes may result in decreased accumulation of these inflammatory cells in the airways.

Asthma

Treatment in the literature. There is a long history of psychological treatments for asthma. When many of the studies of psychological treatments of asthma were conducted, asthma was considered to be a psychosomatic disorder with bronchospasm as the priSusan feature. Psychological treatments have frequently focused on the association between psychological factors such as anxiety and tension, and increased asthma symptoms (Lask, 1991). Anxiety associated with asthma has been treated with relaxation training, systematic desensitization, psychotherapy, cognitive therapy, hypnosis, and family therapy (Lask). Little or no attention has been paid to the importance of airway inflammation.

Hypnotic treatment of asthma typically focuses on symptom relief through suggestions of easier breathing and relaxation. In their review of psychological treatments of asthma, Brown and Fromm (1988) conclude that direct hypnotic suggestions are not useful and typically do not result in increased pulmonary function. White (1961) found that hypnotic suggestions of symptom relief may result in decreased perception of symptoms in absence of, or despite decreases, in pulmonary function. Although the White study is frequently cited, it should be replicated with a wider range of outcome measures and current methodology.

Reviews of the effectiveness of psychological interventions in the treatment of asthma generally conclude that some supportive evidence exists, but further research is necessary (Cluss & Fireman, 1985; Lehrer, Sargunaraj, & Hochron,1992; Lane & Lane,

1991) Preventing strong conclusions of treatment efficacy are numerous methodological flaws in many of the studies (Cluss & Fireman, 1985; Mrazek & Klinnert, 1991). As well, many studies have only limited assessment of lung function, and do not use symptom or peak flow diaries. Thus, treatment effects may have occurred in areas not assessed.

Imagery and Asthma. Following the Simonton method and its variants, it is important to understand the disease process so that the imagery can accurately represent the changes involved in recovery from the disease. Theoretically, to treat asthma it is crucial to target the inflammatory process that underlies the increased bronchial hyperresponsiveness. Thus, the clinician or researcher must understand the pathophysiology of asthma, and be able to communicate this understanding to a lay audience: the asthma patient.

Pathophysiology. Based on current medical research, asthma is considered an obstructive pulmonary disorder that involves narrowing of the airways as a result of (a) contraction of the airway smooth muscles that encircle the trachea and bronchi, (b) thickening of the airway wall from edema and infiltration by cells of the immune system, (c) hyperplasia (an increase in the numbers) and hypertrophy (enlargement) of smooth muscle cells, and (d) blockage of the airways from accumulated mucus, secretions, and cellular debris (Murray, 1995).

The inflammatory process of asthma involves the infiltration of a variety of inflammatory cells into the tissues of the lung. In the early asthmatic response, mast cells resident in the lung release mediators such as histamine when they detect the presence of allergens to which they are sensitized. In addition to effects such as contraction of airway smooth muscle, the mediators recruit other white blood cells to the lung, beginning the late asthmatic response (Murray, 1995). Eosinophils and neutrophils are the priSusan inflammatory cells recruited to the airways in this manner (Monteleone,1994).

The eosinophil is the most important of the leukocytes in the development of airway inflammation. Clinical severity of asthma and pulmonary function is correlated

with numbers of peripheral-blood eosinophils, and levels of eosinophils and eosinophil cationic protein in bronchoalveolar-lavage fluid (Bousquet, 1990). In order to penetrate and migrate across the endothelium into the airways, the eosinophils and other leukocytes must first adhere to vascular endothelial cells. These leukocytes have the ability to increase their adhesive capacity in response to various mediators through the expression of adhesion molecules on their surface. Adhesion molecules are also expressed on the surface of the endothelium, regulating the adhesion and migration of the leukocytes (Walker & Virchow, 1993).

This paper presents a detailed description of the treatment process, clinical observations, and experiences of 3 participants in a pilot study This pilot study was conducted to (a) investigate the efficacy of a psychological intervention involving imagery as an adjunct treatment for bronchial asthma, and (b) refine the treatment protocol for use in larger controlled study. Following a 3 or 4 week baseline, 5 adults with asthma ranging from mild to severe, participated in 8 weeks of training in imagery. Two subjects were withdrawn from the study, one due to a change in medication and an inability to attend treatment sessions, and another because of repeated illness. The first case study is presented in detail to illustrate the steps involved in the treatment. Subsequent case presentations focus on features unique to that case. A detailed description of the study design and results is presented elsewhere (Chapter 3). Pseudonyms are used to protect the confidentiality of the subjects.

Treatment Protocol

The goal of treatment in this study is to effect the underlying processes involved in asthma, with a subsequent increase in lung function and decrease in symptoms. The treatment protocol for this study was based on published descriptions of clinical work and research. Achterberg et al. (1994), Norris (1989), Rossman (1984), and Simonton et al. (1978) provide detailed instructions and clinical examples useful in developing and using an imagery based treatment. With regard to previous research, particular attention was

paid to studies focusing on influencing numbers of inflammatory cells or their adhesion (Hall et al., 1992; Hall et al., 1993; Hall et al., 1995; Rider & Achterberg, 1989).

Unfortunately, the majority of published studies of intentional immunomodulation contain only limited descriptions of the treatment process. Not only does this make replication difficult, but clinical application of the treatment is also impeded. Each researcher or clinician has to invent their own treatment protocol which has not been previously tested. A noteworthy exception, Hall (1990) provides a detailed treatment protocol for both research and clinical practice. To provide continuity of research and avoid "reinventing the wheel" modified versions Hall's scripts were used as part of this study's treatment protocol.

Pre-treatment imagery. In clinical practice, patients are frequently asked to draw representations of the disease or symptom, the medical treatment received, and internal healing resources such as the immune system. The first stage of treatment, according to Norris (1989), is to address any misunderstandings or fears that are revealed in the patient's pre-treatment imagery, allowing the patient to be both realistic and optimistic about potential change. Feelings and beliefs can be elicited by exploring how the patient represents the disease and their health in imagery. Achterberg et al. (1994), and Siegel (1986) assert it also important to include previously existing imagery about the problem and its treatment. In session 1 of this study (Appendix A) participants were instructed to draw their pre-treatment imagery as homework.

Pre-induction. A modified version of Hall's (1990) pre-induction script was used in session 1 to prepare the participants for the induction and treatment process. The pre-induction is used to address misconceptions or fears that may be held about the treatment, provide instructions on how to deal with intrusive thoughts, and elicit "calm scene" imagery that is used to facilitate relaxation and focused attention.

Education and imagery development. As discussed earlier, an accurate understanding of the desired physiological changes precedes imagery development. In

Session 2 (Appendix B) the education script featured a description of the pathophysiological processes involved in asthma as described in current medical literature (e.g., Murray, 1995). Based on their use in clinical practice (e.g., Achterberg et al., 1994), general healing images (e.g., a ball of light) and images representing the desired "end-state" were also incorporated as part of the treatment.

Induction. The use of an induction to facilitate relaxation, focused attention, and/or hypnosis is unquestioned in the literature. In sessions 3 through 8 (Appendix C), a modified version of Hall's induction script, featuring progressive relaxation and hypnotic deepening techniques, preceded instructions to practice the treatment imagery.

Home practice. Home practice of the imagery is used frequently in research (e.g., Locke, et al., 1987; Spanos, Williams, & Gwynn, 1990; Rider & Achterberg, 1989),and invariably in clinical practice (e.g., Norris, 1989; Achterberg et al., 1994). Audio taped scripts are commonly used to assist in home practice.

Case 1 - Jane

Jane was recruited through a community hospital respiratory clinic by a cooperating pulmonologist. Jane is a 65 year old female with asthma of mild severity as assessed by spirometry at the start of baseline. Jane smoked for 30 years prior to quitting 15 years ago. Initial onset of symptoms and diagnosis of asthma reportedly occurred in 1970.

Session 1 (Appendix A)

The first session began with an initial greeting, followed by a request for measurements of her peak flow using a Mini-Wright Peak Flow Meter provided for the study. Peak flow readings were taken at the beginning and end of all sessions. This session was used to establish rapport, obtain case history, and read the pre-induction script.

Jane stated that she believes the mind can influence the body, citing the example of fire walking. Her only prior experience with imagery, hypnosis, meditation, or other

similar interventions was the use of a weight loss tape featuring music and the sounds of birds and the ocean. She reportedly used this tape successfully several years ago. She reportedly has not used any complementary treatments.

Jane stated she was not aware of any benefits of having asthma. This question was asked to assess for potential secondary gain which might effect treatment effectiveness (Barnnett, 1989). Jane hoped the positive consequences of controlling her asthma might be that she would stop coughing, not have to take asthma medication, and that she would no longer have a raspy throat. Currently, she avoids individuals who smoke and smoke filled areas to prevent exacerbation.

The pre-induction script was read to address any misconceptions or fears about the treatment process, and to elicit calm scene imagery that was later used to facilitate relaxation and focused attention during the induction. Jane stated that she imagined herself on her apartment balcony, in a comfortable chair, watching the clouds. Several questions were asked to determine the sensory modalities used in the calm scene imagery. Jane is not usually aware of visual imagery. She reportedly can remember things visually to some extent, but the images are not vivid. Her preferred modalities appear to be auditory and kinesthetic. She stated that she "recalls conversations" and that she is able to "relive them". She also "can feel lots--can almost go to tears when thinking of certain situations". Jane expressed no concerns and was enthusiastic about participating in this study.

Jane was asked to draw imagery representing asthma and the asthma medication before the next session. A copy of the homework instruction sheet was provided at this time (Appendix A).

Session 2 (Appendix B)

We began by discussing the drawings made according to the instructions provided in session 1. To represent asthma, Jane drew a fence, writing on it "this is a fence, built of my asthma, my coughs, my wheezing, my huffing, puffing--always there". Separately,

Jane journaled a representation of asthma improvement: "a fence--high, wide, and foreboding at first, then lower, less restrictive but still there, then lower, almost symbolic only--easy to step over, friendly, unrestrictive". She also described as "a cloud always above me, dark, menacing, omnipresent". The medication was described as "a long ever unreeling chain made of inhalers--always a reminder of limits". Jane drew a line of inhalers connected end-to-end by links of chain.

The education component required for images 1 and 2 was presented with Jane describing mast cells as "a bunch of balls, small and round". Jane thought of several alternative ways of representing images 1 and 2, but was not satisfied with any of her ideas. Due to time constraints, the imagery was not developed any further in this session. Jane was asked to continue to develop and draw the imagery during the week between sessions 1 and 2. An audio tape containing the induction and treatment script (Appendix C) was provided for home practice.

Session 3 (Appendix C)

Jane reported listening to the audio tape 3 times this past week. She did not complete any drawings but did journal the following statements:

> On 'good' days--blue skies, warm soft breeze, misty warm rain, fluffy white clouds. Everything is easy, oh so easy. My medication, now (upon meditation) appears to me as caring hands-- as "you're in good hands with" Serevent, Becloforte, and Tilade.

During the past week, Jane developed representations of images 1 and 2 that she was satisfied with. The mast cells (image 1) were described as:

> Like little chicks of a chicken or a duck. They are by a hill, by a lake, and they have learned to settle down and not jump in the water and get excited or call for help. There is a mother hen that is telling them to remain calm and to wait for her to say when the threat is real.

Decreased adhesion or "stickiness" of white blood cells (image 2) was described by Jane as follows: "the way to remove the stickiness of the cells was to put a cape on them, virtually making them ineffective--it has a shiny repellent surface that you could wipe off." Jane stated that she was unable to draw the imagery.

The rest of the session was used to complete the education script and develop the remaining images. Little chicks, somewhat larger than the chicks representing mast cells, symbolized the decrease in inflammatory cell activation (image 3): "they too remain calm and quiet, but alert". "Something tight and choking, like hands" was Jane's description of bronchospasm. The relaxation of the smooth muscle (image 4) was imagined as "the release of the hands that are choking a long tube or hose". This image included an auditory component, "start with a gasp and gurgle, then a sound of relief--a deep breath, a sigh", and a kinesthetic component, "a feeling of constriction and choking, and then release". To describe the decreased mucus production, thinning of mucus, and ciliary action (image 5) Jane stated:

> I see it being hosed down--diluted so it isn't so thick and a problem. I see a broom literally sweeping this mucus away--but not thoroughly because you need some of it--but you want to keep the passage way clear. Swish of the sweep--sound of a broom on a wet sidewalk--hosing is a gentle sound (auditory component). A clean feeling--and fresh air, refreshed, like a good airing out (kinesthetic component).

Image 6, the general healing image, developed very quickly: "I see right away, a blessing, a laying of hands and praying--a murmuring of words....I see myself in line receiving the laying of hands--feeling of hope". Healthy, clear and open airways (image 7a) were described as follows:

> I picture them as being a very good color--a deep pink. I see the airways as passages of water flowing and never backed up, never blocked, every flow of water goes off into little tributaries--good clear water--no end to it--as strong at the end as the beginning, no sludge, no impurities.

Later in the session, Jane stated she thought water symbolizes life.

For the final image, representing herself as vibrant and healthy (image 7b), Jane stated that she saw herself with skin that doesn't bruise as easily as it does now, and without stiffness or knee pain: "I feel younger, lighter, care-free, relaxed, healthy, and aware that I have no aches and pains".

Session 4

Jane described experiences from this past week that she found very encouraging, leading her to believe that changes were occurring in her body and that the treatment was effective for her. She began by saying she felt "strong, lasting, and enduring". She described to me and also journaled: "On Monday...(after using the audio tape) my mind felt clear, refreshed, and it came to me exactly where to look for a certain piece of mail that I had misplaced--I found it immediately". After practicing with the audio tape this morning, she reportedly felt very energetic, vacuumed her apartment, and washed the bathroom floor. She emphasized that this was a remarkable occurrence for her because she usually gets out of breath just by taking the vacuum out of the closet. Jane journaled:

> I felt invigorated and full of energy, and proceeded to do some vacuuming that had previously seemed far too strenuous for me. I was very aware of feeling great--my breathing is easy and deep. No wheezing, or gasping, or shallow breathing.

Once home practice commenced, I asked early in each session if there had been any changes in the imagery. Jane reported that she has difficulty imagining the relaxation of the airway muscles, although she was able to imagine them "loose like the jowls of a dog". The mucus image changed to a house with a "fan blowing, cilia sweeping", and water flowing through the house diluting the mucus. The imagery representing the healthy airways became flowing water with tributaries. Having not yet drawn any of the treatment imagery, Jane explained that she "must have a block about it".

Following the debriefing of the home practice, and discussing any other relevant issues, I read the induction and treatment script. During the mucus imagery, I observed

Jane swallow more frequently and begin coughing. Afterwards, Jane reported experiencing some brief choking. She stated it did not interfere with the imagery, and she "still didn't feel (her) arms and legs".

Session 5

Jane reported that her morning expiratory peak flow was low today and she did not know why. Jane stated: "I have noticed increased endurance", again providing the example of doing "a lot of housework non-stop without needing a rest". She emphatically said she is "feeling super". Although she did not fill out the home practice section of the asthma diary, Jane stated she practices the imagery everyday, looks forward to it, feels it is beneficial and educational, and is committed to it.

The water described earlier as part of the healthy lungs image changed to warm refreshing air flowing through the house: "The lungs are healthy, the air restores, heals, and maintains--air is reaching every area". In the homework instructions for session 2, it is suggested that imagery can be practiced briefly when taking the asthma medication. Jane reported that she had not yet tried this. Jane estimated that she practiced the imagery briefly without the use of the audio tape on several occasions while telling others about this study. As well, she occasionally says to herself "calm down--nothing to get excited about".

Jane described a red or deep crimson color that spontaneously appeared and "floated around" during the mucus imagery section of today's treatment. This was reportedly "very enjoyable, and felt nice".

Following the treatment, Jane mentioned that several times during live or audio taped practice, she experienced overwhelming sad feelings when hearing the word "feeling" in the healing image section of the script. The following description provided by Jane illustrates that she does not use visual imagery as well as her other senses: "I am still having difficulty with imagining the loosening of the muscles. I can imagine something

relaxing and opening, but I can't see it or picture it--it is abstract". I reassured her that she did not have to imagine it visually, and that drawing the image may aid in its development.

Session 6

Jane began this session by stating she had experienced a high level of stress this past week because of an event that was particularly upsetting for her. At the time of the event, Jane was concerned that the stress would lead to an exacerbation of the asthma. In an effort to control how her immune system might react to the stress, she repeatedly said, "be calm my little chicks", speaking to her mast cells and other white blood cells. Jane believed that her peak flow in fact did not change as a result of the stress. According to her asthma diary there were no notable changes in her peak flow or symptoms between sessions 5 and 6.

Jane missed only one day of home practice this week. She said she is "getting strength from it (treatment)--I don't ever want to miss it". The imagery of smooth muscle relaxation developed into an image of a tight fist that changes to a fully open hand. She practiced two additional times without the tape this week.

In the treatment script, I allow time for integration of the treatment images. I asked Jane what she imagines during this time. She replied:

> (There is a) sense (that) one image is now aware of the next one--there is a feeling of well being. Instead of being isolated, each image is aware of the next one. The image of the chicks--there is more of them and they are aware of the white blood cells being not sticky--aware of the cilia sweeping out the diluted/weakened mucus. It seems like more of an overview. It is like a working together type of feeling.

There was a notable change in the healing image during this session, it was "very happy, and light and bright, not like the heaviness of previous weeks". Jane commented that during treatment session 4 she had the "greatest urge to cough" but was able to "relax it

away". Today, she was unable to suppress it and coughed a few times during the treatment.

Session 7

Jane spent several days this past week vacationing in the mountains. Jane described how she was able to be very physically active (e.g., running) without need to take a rest or difficulty breathing.

Currently, in addition to practicing with the audio tape, Jane thinks of the imagery 3 or 4 times each day for varying lengths of time. As previously stated, she does not practice the imagery while taking her medication.

Jane mentioned that approximately 50% of the time, when using the audio tape, she does not listen to the relaxation induction prior to the treatment script. Instead, she briefly relaxes on her own, prior to listening to the treatment script. Jane instituted this change on her own volition. I noted the change but did not encourage or deter further use of the relaxation induction.

Session 8

Jane remarked that she attended a party on the weekend and did not have to leave the smoke-filled environment. She stated: "there was a lot of smoke...it didn't bother me...(I) kept telling my little chicks--don't get excited". Additionally, she spent 7 hours "in a damp basement helping to catalogue books...(climbing) up and down stairs...with no coughing, wheezing, no symptoms at all".

On one occasion, Jane "recalled" the images while simultaneously listening to the treatment section of the audio tape and doing housework. She commented on hearing parts of the script that she had not noticed previously.

Compared to baseline, Jane thought that she had less coughing, morning wheeze, daytime wheeze, and shortness of breath. "I can take a deep breath and I am aware there is no wheezing or shortness of breath". These descriptions are consistent with decreases in symptom scores on the asthma diary in areas including: had to take a rest, chest

tightness or discomfort, morning wheeze, and daytime wheeze. Jane commented her "memory seems better" and she is better able to cope with stress. She enthusiastically expressed that she will continue to practice the imagery. Jane's comments on her change in symptoms were made without the benefit of earlier asthma diaries which were given to the respiratory therapists during the monthly lung function assessments.

Case 2 - Susan

Susan is a 48 year old female with asthma of mild severity as assessed by spirometry at the start of baseline. She was diagnosed with asthma approximately 12 months prior to entry into this study.

Session 1

Susan reported that she is mildly allergic to cat and dust, and she "reacts strongly" to smoke. Emotions, particularly anxiety, "set off" her asthma. Approximately 8 months prior to this study she attended qi-gong classes on an irregular basis and received 6 to 8 weekly treatments of acupuncture with reportedly no discernible change in the asthma. She consciously changes from thoracic to abdominal breathing an estimated 4 to 5 times each week (for e.g., when inhaling medication). Susan responded to my query that, yes, she does believe the mind can influence the body, adding that she thinks the "spirit may influence it more". For Susan, a benefit of having asthma is that it has forced her to change her lifestyle in positive ways. She thought that she would be able to maintain those positive changes if she was able to more fully control her asthma.

Susan drew and journaled throughout the study, going far beyond the minimum requirements of the study. Susan provided 2 drawings representing her medication. One drawing was of a gun shooting her, representing how she felt about asthma medication around the time of diagnosis, 1 year ago. The other was entitled "a new dawn": a brightly colored inhaler with blue medication streaming out of it, merging with a yellow ball. This is how she currently feels about the medication. Many of her drawings featured aspects of nature, such as trees, flowers, and water.

Session 2

During treatment sessions and home practice throughout the study, Susan had several powerful experiences of spontaneous changes in her imagery. For example, while developing imagery representing her mast cells not reacting to dust, she reported:

> I just became aware of smelling and tasting dust--felt like being in a big dust ball. I'm pushing it aside, wading through it. I don't know if there is an edge. If I can get through it, I will get to the white side. If I can just imagine it, I can do it did it and now I can just breath in all that white stuff (deeper breaths) -feels calmer.

Afterwards, Susan was very tired, and expressed that she had "never had such vivid imagery". Partly due to these experiences and the resulting discussions, the majority of three sessions (2, 3, and 4) were used to develop the treatment imagery.

Session 3

Even though she was sitting up at the time, Susan had fallen asleep during the audio taped induction 4 out of 6 times during home practice. She estimated she was only sleeping for 3 to 4 hours each night for most of the week, possibly as a result of depression--Susan was prescribed Prozac 3 days prior to this session. I suggested she could omit the progressive relaxation component of the induction, instead starting with the calm scene imagery that precedes the treatment imagery.

Session 4

Susan reported that for the past week, she would quickly relax her body on her own before listening to the treatment section of the audio tape. Susan remarked about changes she has noticed: "I have the sense that things are shifting in my lungs, either the lungs are opening up or the asthma is getting smaller--letting go". As well, occasionally when she smells something she would normally react to, such as a musty smell, she begins swallowing (which she associates with mucus image), and as a result "not feel like she had to leave".

Sessions 5 & 6

Some shortness of breath and chest tightness was experienced while hiking during a trip to the mountains. Susan said that her "mind is wandering a lot" while listening to the tape, but that hearing my voice after the periods of silence "brings her back". She practices the imagery without the audio tape by thinking of the images when walking outside, and she has practiced the imagery while taking medication approximately 2 times.

Sessions 7 & 8

Susan stated she "feels differently inside when inhaling. Feeling that everything is expanding more--(breathing) is more abdominal, then upwards into chest, rather than a tight little breath". Currently, Susan sometimes uses the progressive relaxation section of the induction, at other times she omits it. Even without the relaxation induction, she occasionally falls asleep while listening to the tape, waking up a couple hours later. Susan commented that she used to experience a burning sensation in the area of her esophagus, but that it has disappeared during the last 8 weeks. She is exercising more with her bike without experiencing symptoms, and a recurring pain in her chest has changed in quality recently. Similar to Jane, Susan mentioned that she talks to herself, saying "it's OK, it's just temporary" when she smells something she may react to. Commenting on the experience of participating in this study, Susan said she is not as angry and frightened by asthma as she was previously, and that it has "put (her) more in touch with what is going on" in her body. Compared to baseline, Susan had decreases in self-report symptom scores in the areas of chest-tightness or discomfort, and shortness of breath.

Case 3 - John

John is a 42 year old male with severe asthma as assessed by spirometry at the start of baseline. He was first diagnosed with asthma approximately 7 years ago.

Session 1

The impact of asthma on John's life is considerable. His weight increased from 180 to 240 lb during the 3 years he has been taking oral prednisone. He was also prescribed Paxil to treat the depressive side effects of Prednisone. John also had to leave a well paying job due to the impact of the occupational environment on his lungs. Medication costs were estimated by him to be $300.00 to $400.00 per month. John stated he believes the mind can influence the body, commenting that he has used progressive relaxation on a regular basis to fall asleep since he was approximately 10 years old.

Session 2

John reported he was diagnosed with a respiratory infection and had been prescribed an antibiotic. He commented that his level of stress has been very high for the past few months and particularly so for the last week. He rated his level of stress as 10 on a 10 point scale, with 10 being the most severe.

Session 3

John reported an increase in symptoms and continued stress which he predicts will continue for the duration of the study. He expressed belief that the prescribed antibiotic is not working. Possibly related to his use of progressive relaxation to fall asleep, John expressed that he may have fallen asleep during the relaxation induction while practicing with the tape. His wife apparently woke him up afterwards and told him that he was snoring, yet he remembers the imagery and was aware of background noise in his house. He reportedly has the ability to lucid dream. On at least one occasion following home practice, John experienced a 1 hr long absence of a severe burning sensation in his chest. He expressed that this was a welcome break from the sensation that is normally continuous each time he has a respiratory infection.

Session 4

John reported that his image of decreased inflammatory cell activation (image 3) spontaneously changed from realistic (concrete) to symbolic. The new image was of a

"white blood cell being calmed", a rounded shape containing numerous small circles of "calming" colors (see Discussion section).

He described one day when he listened to the audio tape just prior to sleeping: "(I) didn't wake up coughing like I usually do, and there was less phlegm in the morning". He fell asleep, and did not remember the imagery each of 3 times he practiced this past week. I strongly encouraged him to stress the imagery aspect of the treatment, and to omit the relaxation induction if necessary. Two changes were made to John's in-session treatment for the remainder of the study: progressive relaxation was omitted from the induction, beginning instead with the calm scene imagery; and I asked John to nod his head between each image to signal he was ready to proceed. The latter modification was to ensure John had not fallen asleep during the treatment session, as it was often difficult to tell due to a change in the sound of his breathing. John found the use of the signal beneficial as it "put the conscious mind back into it (the treatment)". I felt that using the signal was was also more permissive, allowing the participant to decide if they wanted to stay with a particular image for a longer time. Following this experience, I incorporated the use of a signal into the treatment sessions of the other participants, non of whom indicated it was distracting or detracted from the imagery.

Session 5

John was prescribed a second antibiotic and a nasal decongestant by his physician. His symptoms and peak flow have improved. Starting 2 days ago, John "realized that when coughing up phlegm or wheezing, the image of blocking the mucus just comes up automatically". For the remainder of the treatment sessions, John continued to report various spontaneous imagery when coughing, reading, or even when looking at a photograph that reminded him of his calm scene.

Session 6

John stated with pleasure that for the past 2 weeks he has only needed to carry his Ventolin with him, instead of a bag containing all of his medication. He is reportedly

feeling much better this past week, with decreases in chest tightness, "breathless feeling", and cough with expectoration.

Session 7 & 8

John associated increased symptoms with stress and physical activity related to a residential move. John estimated that he made between 40 and 50 trips up and down the stairs in his house carrying boxes weighing up to 80 lb. While he reported stopping occasionally to catch his breath, he found he did not require Ventolin. In comparison, during session one, John expressed concern about parking in the parkade because he could not climb five flights of stairs without requiring Ventolin. As well, his wife remarked to him that she noticed his increased physical capacity. During the rest breaks to catch his breath, John practiced the imagery representing himself as vibrant and healthy. Spontaneous imagery occurred more frequently this past week, an estimated 6 to 12 times per day. Commenting on his improvement, John expressed: "Usually the heat bothers me, but it isn't now, I'm amazed....It has really helped me....I know for a fact I couldn't have done this (climbing stairs) before....I feel I have improved more in the last 8 weeks than with anything else I have tried". Comparing the last 4 weeks of treatment (following recovery from the respiratory infection) to baseline, John had decreases in self-report symptom scores in all 8 areas of symptoms measured (see Chapter 3).

Discussion

The participants in this study appeared to be motivated and receptive to the training, and both in-session and home practice. Feedback and observations related to the treatment protocol and participant experiences have implications for the use of this protocol in a future controlled study. Subjective descriptions of symptom improvement are anecdotal, but suggestive of a treatment effect.

Protocol. In clinical practice, Norris (1989) utilizes pre-treatment imagery to assist her clients in being both realistic and optimistic about their disease. In this study, the pre-treatment imagery was briefly discussed but not interpreted. It primarily served the purpose of supplementing the case histories by illustrating the impact that asthma has had on the lives of the participants. The process of sharing the imagery with the researcher may have facilitated rapport as it demonstrated the interest of the researcher in their personal experience of asthma. Although not explored in this study, the process of developing, drawing, and sharing the pre-treatment imagery may have prepared the participants for the task of developing and drawing several treatment images.

The education script was well received with the exception of the description of mast cells, antibodies, and allergens in image one. Aspects of this section frequently required repetition or elaboration before it was fully understood by the participants. It was difficult to develop this section of the script because there is no guidance from the literature in determining how much detail is necessary or beneficial. Achterberg, et al. (1994) emphasizes the importance of an accurate understanding of the process involved in the disease or condition, medical treatment, and natural processes involved in recovery from that condition. In contrast, the education component of Hall's (1990) protocol is very brief, and provides a minimal description of the immune process. Thus, it is not possible to know if a brief, simple, and possibly less confusing description of allergen recognition mast cell activation would suffice, or if the more complicated and detailed description is necessary. My observation is that the participants requested additional

details and clarification until they adequately understood the process they were representing in imagery. Perhaps, an education script cannot be expected to provide descriptions that will be understood by all, necessitating the provision for elaboration as needed.

Overall, participants provided positive feedback on the presentation and effectiveness of the induction script, whether presented live and on audio tape. John found he would fall asleep if he listened to the progressive relaxation section of induction. This is likely a conditioned response resulting from long term use of progressive relaxation to fall asleep. Both Susan and Jane found they did not always require the induction, and began omitting the progressive relaxation from home practice in the latter half of the study. The above participants continued to use the "calm scene" imagery section of the induction prior to practicing the treatment imagery.

In the current protocol, the induction features approximately 10 minutes of progressive relaxation followed by approximately 3 minutes of calm scene imagery. Considering the positive treatment effects demonstrated in this study with partial or complete omission of progressive relaxation, it appears that only a brief period of relaxation may be required. Although, this may only be the case after several sessions of practice with the full induction. Low motivation to continue with relaxation training may be involved in high dropout rates in other studies. Out of 11 subjects receiving relaxation training as a treatment for asthma, 2 dropped out within the first 8 sessions, and a total of 5 dropped out before completing 16 sessions (Lehrer et al., 1986)

There is some evidence that an induction may not be required at all. Spanos, Stenstrom, and Johnson (1988) found that subjects who listened to a brief hypnotic induction prior suggestions to imagine their warts receding were equally likely to lose warts as those given the suggestions to image without any prior induction. Spanos et al. also found that self-reported ratings of relaxation or alterations of experience frequently found with hypnosis, were not related to wart regression.

Points of Clinical Interest. Several aspects of participant experiences deserve comment. There were no apparent critical differences between the participants. Jane had difficulty developing visual representations of some of the images, but this did not appear to have any notable impact on her treatment. Instead, she made extensive use of internal dialogue and experienced auditory and kinesthetic representations of the imagery. Susan and John were very adept at visual imagery, and Susan experienced occasions of very strong kinesthetic components to her imagery. All three subjects readily became engrossed in the imagery during in-session practice. Instances of difficulty attending to the imagery were often related to unusually high periods of stress for Susan and John.

Considering the many changes in the imagery of the participants, it appears useful to encourage receptivity to these changes. The change in John's imagery from concrete to symbolic is consistent with descriptions provided in the literature. With increased experience using imagery, concrete imagery is frequently replaced by images that are more symbolic of the desired changes. The symbolic images have been observed to be more powerful than the concrete imagery (Achterberg et al., 1994).

Each participant used their imagery skills in some way beyond that expected or instructed in the study. Jane spoke to her immune system when under extreme stress or when exposed to asthma triggers, such as smoke filled room. Susan associated swallowing and the mucus image, using both in an attempt to prevent or decrease her reaction to a musty smell. John practiced imagery representing himself as vibrant and healthy under conditions of physical exertion. Participants were instructed that they could supplement their home practice sessions with brief periods of imagery without the aid of the audio tape. Susan intentionally did this numerous times towards the end of the study. John, however, experienced involuntary spontaneous imagery triggered primarily by symptoms. Norris (1989) calls brief periods of imagery "constant instant practice", and asks her patients to practice the brief imagery as often as possible, suggesting it be associated symptoms (p. 64).

Implications. As this is an anecdotal study, further controlled research is necessary before any clear generalizations or conclusions can be made. Testing the treatment protocol in this pilot study has provided valuable participant feedback, observations, and clinical experience, facilitating minor revisions to the scripts.

The tendency of participants to stop using the progressive relaxation component of the induction, either by choice or necessity, is disconcerting with respect to a [illegible] controlled study. Is it possible to increase compliance? How much variation in a treatment is acceptable? In clinical practice, psychological interventions are modified to suit the patient according to innumerable constantly changing factors. Controlled studies strive to hold constant as many variables as is possible. The treatment process in this study was allowed to vary to some degree to facilitate refinement of the treatment protocol. The use of progressive relaxation as part of the induction changed for two of three participants. In a controlled study, what would be the effect of insisting that John continue to use progressive relaxation? Would he have to be withdrawn from the study? If an intervention is not modified to suit the changing needs of the patient, will it still be effective? Answering these questions is beyond the scope of this paper, but they do serve to illustrate the complex issues involved in conducting research on psychological interventions.

References

Achterberg, J. (1985). Imagery in healing: Shamanism and modern medicine. Boston: New Science Library.

Achterberg, J., Dossey, B.. & Kolkmeier, L. (1994). Rituals of healing: Using imagery for health and wellness. NY: Bantam

Barnnett, E. A. (1989). Analytical hypnotherapy: Principles and practice. Glendale, CA: Westwood Publishing.

Bousquet, J., Chanez, P., Lacoste, J. Y., Barneon, G., Ghavanian, N., Enander, I. (1990). Eosinophilic inflamation in asthma. The New England Journal of Medicine, 323(15), 1033-1039

Bresler, D. (1984) Mind-controlled analgesia: The inner way to pain control. In A. A. Sheikh (Ed.), Imagination and Healing (pp. 211-230). Farmingdale, NY: Baywood.

Brown, D.P., & Fromm, E. (1988). Hypnotic treatment of Asthma. Advances, 5(2), 15-27.

Cluss, P. A., & Fireman, P. (1985). Recent trends in asthma research. Annals of Behavioral Medicine, 7(4), 11-16.

Hall, H. (1990). Imagery, psychoneuroimmunology, and the psychology of healing. In R. G. Kunzendorf & A. A. Sheikh (Eds.), The Psychophysiology of Mental Imagery: Theory, Research and Application (pp.203-227). Amityville, NY: Baywood

Hall, H., Minnes, L., Tosi, M., & Olness, K. (1992). Voluntary modulation of neutrophil adhesiveness using a cyberphysiologic strategy. International Journal of Neuroscience, 63, 287-297.

Hall, H., Minnes, L., & Olness, K. (1993). The psychophysiology of voluntary immunomodulation. International Journal of Neuroscience, 69, 221-234.

Hall, H., Papas, A., Tosi, M., & Olness, K. (1995). Directional changes in neutrophil adherence following passive-resting vs. active-imaging. (submitted).

Lane, D. J. & Lane, T. V. (1991). Alternative and complementary medicine for asthma. Thorax, 46, 787-797.

Lask, B. (1991). Psychological treatments of asthma. Clincial and Experimental Allergy, 21, 625-26.

Lehrer, P. M., Hochron, S. M., McCann, B., Swartzman, L., & Reba, P. (1986). Relaxation decreases large-airway but not small-airway asthma. Journal of Psychosomatic Research, 30(1), 13-25.

Lehrer, P. M., Sargunaraj, D., & Hochron, S. (1992). Psychological approaches to the treatment of asthma. Journal of Consulting and Clinical Psychology, 60(4), 639-643.

Locke, S. E., Ransil, B. J., Covino, N. A., Toczydlowski, J., Lohse, C. M., Dvorak, H. F., Arndt, K. A., & Frankel, F. H. (1987). Failure of hypnotic suggestion to alter immune response to delayed-type hypersensitivity antigens. Annals of the New York Academy of Sciences, 496, 745-749.

Monteleone, C. A. (1994). Allergy. In L. H. Signal & Y. Roy (Eds.), Immunology and Inflammation: Basic Mechanisms and Clincal Consequences (pp.537-584).

Mrazek, D. A., & Klinnert, M. (1991). Asthma: Psychoneuroimmunologic considerations. In R. Ader, D. L. Felton, & N. Cohen (Eds.), Psychoneuroimmunology (pp.1013-1035). New York: Academic Press.

Murray, R. K. (1995). Mechanisms of bronchoconstriction and asthma. In M. A. Grippi (Ed.), Lippincott's Pathophysiology Series: Pulmonary Pathophysiology (pp. 77-92). Philadelphia: J. B. Lippincott Company.

Norris, P. A. (1989). Clinical psychoneuroimmunology: Strategies for self-regulation of immune system responding. In J. V. Basmajian (Ed.), Biofeedback Principles and Practice for Clinicians (3rd ed.) (pp. 57-66). Baltimore, MD: Williams & Wilkins.

Rider, M. S., & Achterberg,. J. A. (1989). Effects of Music-Assisted Imagery on Neutrophils and Lymphocytes. Biofeedback and Self-Regulation, 14(3), 247-57.

Rossi, E. (1993). The Psychobiology of Mind-Body Healing (2nd ed.). New York: Norton.

Rossman, M. L. (1984). Imagine Health! Imagery in medical self-care. In A. A. Sheikh (Ed.), Imagination and Healing (pp. 231-258). Farmingdale, N. Y.: Baywood.

Siegel, B. S. (1986). Love, medicine & miracles: Lessons learned about self-healing from a surgeon's experience with exceptional patients. New York: Harper & Row.

Simonton, O. C., Matthews-Simonton, S., & Creighton, J. L. (1978). Getting well again: A step-by-step, self-help guide to overcoming cancer for patients and their families. New York: Bantam Books.

Spanos, N. P., Stenstrom, R. J., & Johnston, J. C. (1988). Hypnosis, placebo, and suggestion in the treatment of warts. Psychosomatic Medicine, 50, 245-260.

Spanos, N. P., Williams, V., & Gwynn, M. I. (1990). Effects of hypnotic, placebo, and salicylic treatments on wart regression. Psychosomatic Medicine, 52, 109-114.

Walker, C., & Virchow, J. -C. (1993). T-cells and endothelial cells in asthma. Allergy, 48, 24-31.

White, H. C. (1961). Hypnosis in bronchial asthma. Journal of Psychosomatic Research, 5, 272-279.

Zahourek, R. P. (1988). Imagery. In R. P. Zahourek (Ed.), Relaxation & imagery: Tools for therapeutic communication and intervention (pp. 53-83). Philadelphia: W. B. Saunders Company.

Running head: SELF GENERATED IMAGERY & ASTHMA

Self-Generated Imagery as an Adjunct Treatment for Asthma: A Pilot Study

Keith E. Zukiwski

University of Alberta

In recent years, complementary therapies have received widespread attention in the media and popular literature (Moyers, 1993; Siegel 1986). Thirty four percent of respondents in a U.S. random national sample (N = 1539) reported using at least one of 16 categories of "unconventional" therapies (therapies not generally taught in medical schools or available in hospitals) in 1990 (Eisenberg et al., 1993). Some of the therapies utilized, and the percentage of respondents who used them, were as follows: imagery (4%), relaxation techniques (13%), massage (7%), hypnosis (1%), biofeedback (1%), and acupuncture (<1%) (Eisenberg et al.). Currently, "complementary" is the preferable term for these therapies (Lane, 1994). Patients with serious illnesses such as cancer, high blood pressure, and diabetes typically do not pursue complementary therapies to the exclusion of conventional medicine (Eisenberg et al.)

Anecdotal reports on the use of psychological interventions in the treatment of asthma are numerous and include: imagery and relaxation (Mendelberg, 1990), psychotherapy (Erickson, 1977), and therapeutic metaphors (Kershaw, 1987). Psychological interventions such as relaxation training, systematic desensitization, psychotherapy, and cognitive therapy typically focus on decreasing anxiety and tension (Lask, 1991). Reviewers frequently cite methodological problems as preventing conclusions supportive of treatment efficacy (Cluss & Fireman, 1985; Mrazek & Klinnert, 1991; Richter & Dahme, 1982).

Hypnotic suggestions of relaxation and easier breathing have been used to target bronchoconstriction. Although its effectiveness is questioned by some reviewers (Brown & Fromm, 1988), hypnotic suggestions have been associated with improvements in forced vital capacity, peak flow, and symptoms in children experiencing asthma attacks (Aronoff, Aronoff, & Peck, 1975). Some individuals with asthma react to non-hypnotic suggestions of bronchoconstriction and bronchodilation with directional changes in mean forced expiratory flow between 25% and 75% of the expired vital capacity ($FEF_{25-75\%}$), but not forced expiratory volume in 1 second (FEV_1) (Isenberg, Lehrer, & Hochron, 1992).

Studies examining relaxation training as a treatment for asthma have produced mixed results. In one review of relaxation therapies, techniques involving a mental component such as autogenic training, biofeedback, or systematic desensitization, were found to be associated with clinically significant improvements in lung function, while muscle relaxation alone appeared to be ineffective (Erskine-Milliss & Schonell, 1981). Of subjects with asthma who received relaxation training combining progressive relaxation, systematic desensitization, and biofeedback, only those with large airway obstruction demonstrated a short-term improvement on a methacholine challenge test (Lehrer, Hochron, McCann, Swartzman, & Reba, 1986). Philipp, Wilde, and Day (1972) found relaxation and breathing exercises decreased airway reactivity to a methacholine challenge test compared to controls, but did not assess type of airway obstruction. In children with mild to moderate asthma, a relaxation intervention that involved tensing then relaxing muscles did not improve the treatment efficacy of an asthma self-management program compared to controls (Vasquez & Buceta, 1993).

In general psychological therapies have not addressed airway inflammation. Airway inflammation is found even in those with mild asthma (Beasley, Roche, Roberts, & Holgate, 1989), and appears to be associated with airways hyperresponsiveness and airway obstruction (Bergner & Bergner, 1994). A psychological intervention that could effect the inflammatory process would be highly desirable. Indeed, substantial evidence exists that various psychological interventions can influence human immune function.

Recession of warts following hypnotic suggestions is reported in both case studies (Rowe, 1982; Tasini & Hackett, 1977) and controlled studies (e.g., Johnson & Barber, 1978; Spanos, Stenstrom, & Johnston, 1988). In a controlled study, suggestions to imagine wart regression were more effective than either a conventional treatment (salicylic acid), placebo, or no treatment (Spanos, Williams, & Gwynn, 1990). Vividness of imagery is associated with greater wart reduction (Spanos, Stenstrom, & Johnston, 1988).

Warts are caused by the human papillomavirus and their recession may be the result of an immune reaction (Bolton, 1991) or vasomotor changes (Sheehan, 1978).

Within the field of psychoneuroimmunology, multidisciplinary studies have repeatedly demonstrated intentional modulation of the immune system using psychological interventions. For example, children who received hypnotic suggestions specifying increased salivary immunoglobulins (sIgA) demonstrated significant increases in sIgA while children who received nonspecific suggestions did not (Olness, Culbert, & Uden, 1989).

A widely used imagery technique involves imagining desired physiological changes while in a relaxed and focused state (Achterberg, Dossey & Kolkmeier; 1994; Simonton, Matthews-Simonton, Creighton, 1978). The book Getting Well Again (Simonton et al.), describes the development and application of the technique, and has sold over 1 million copies (Moore, 1995). In controlled studies with normal subjects, imagery representing directional changes in immune functioning has been associated with changes in neutrophil adherence (Hall, Minnes, Tosi, & Olness, 1992; Hall, Papas, Tosi, & Olness, 1995) and numbers of lymphocytes and neutrophils (Rider & Achterberg, 1989). Delayed hypersensitivity reactions have been inhibited in a single case study using meditation and imagery (Smith, McKenzie, Marmer, & Steele, 1985), and in a controlled study with hypnosis and imagery (Smith et al., 1992). Natural killer cell function significantly increased following relaxation and imagery (Zachariae et al., 1990). Increases in sIgA were significantly greater in a group using music assisted imagery than in music alone or control groups (Rider & Weldin, 1990).

A method of intentionally altering the adherence of eosinophils and other leukocytes could be an important adjunct treatment of asthma. Leukocyte adhesion to vascular endothelial cells is necessary for the leukocyte to penetrate and migrate across the endothelium and accumulate at extravascular sites of inflammation (Walker & Virchow, 1993). Adhesion molecules expressed on endothelial adhesion molecules cells are also a

potential target for treatment as they are involved in the regulation of the adhesion and migration of the leukocytes (Walker & Virchow). Although intentional modulation of leukocyte adhesion has been demonstrated in normal subjects, this effect has not been examined in a clinical population. Asthma meets the criteria of a suitable disease model to research psychological techniques of immunomodulation (Mrazek & Klinnert, 1991; Rossi, 1993).

The purpose of the present study was to refine a treatment protocol for use in a future controlled study, and to examine the use of self-generated imagery as an adjunct treatment for asthma. The treatment involves education about the pathophysiology of asthma and desirable changes that are associated with improved lung function. Based on this information, the participants create their own imagery that represents the desired changes at a structural and cellular level. The imagery is evoked and rehearsed in training sessions and home practice. "Baseline vs. treatment" comparisons of lung function, symptoms, and medication use, serve as objective and subjective criteria for assessing treatment efficacy.

Hypothesis. Adults with mild to severe asthma who are trained in, and practice, using relaxation-assisted imagery representing desirable functional and cellular changes in the lungs will demonstrate improvement in lung function when compared to baseline.

Method

Subjects

Unpaid volunteers with mild to severe asthma were recruited by a collaborating pulmonologist from a population of patients seen regularly at a community hospital respiratory clinic. Potential participants were pre-screened according to the following inclusion criteria: (a) age 18 to 65, (b) diagnosis and history of bronchial asthma, (c) on a stable preventative regimen involving inhaled anti-inflammatory medication for a minimum of 6 weeks prior to the study, (d) nonsmoker. Although the inclusion criteria originally included $FEV_1 \leq 80\%$ of their predicted value, and was limited to mild or moderate

asthma, this criteria was relaxed near the end of the recruiting stage due to a difficulty in recruiting subjects.

Exclusion criteria included: asthma related hospital admissions, respiratory infection, or changes in medication within 6 weeks prior to entering the study. Based on the recommendations of Kiecolt-Glaser and Glaser (1988), the following were also considered criteria for exclusion due to their potential effects on immunologic functioning: recent surgeries; pregnancy; recent childbirth; infectious disease; severe health problems, other than asthma, that may affect the immune or endocrine systems; and recent severe weight changes.

Four women, ages ranging from 18 to 65, with mild to moderate asthma, and one man, age 43 with severe asthma met the above criteria and volunteered to participate. One subject was withdrawn from the study due to a change in asthma medication during study and an inability to attend 4 out of 8 treatment sessions. A second subject was withdrawn from the analysis due to repeated illness, including bronchitis, and associated asthma exacerbation, from which she did not recover during the treatment period.

Case 1 is 65 year old female who smoked for 30 years prior to quitting 15 years ago. Her FEV_1 at the start of baseline (S1) was 74 % of predicted (%prd). Her medications include: Serevent, Becloforte, Tilade, and Ventolin (p.r.n.). Case 2 is a 48 year old female with an FEV_1 of 86%prd at S1. Her medications include: Becloforte and Ventolin (p.r.n.). Case 3 is a 42 year old male with an FEV_1 of 40%prd at S1. His medications include: Becloforte, Serevent, Tilade, Prednisone, Paxil, and Ventolin (p.r.n.).

The protocol for this study was approved by the ethics committee of the Department of Educational Psychology, University of Alberta, and the Research Steering Committee of the Caritas Health Group. Informed consent was obtained from all participants (see Appendix D for informed consent form).

Measurements

All assessments of lung function (Cybermedic Spinnaker TL spirometer, Colorado) were performed according to American Thoracic Society (ATS) (1987) criteria by experienced respiratory therapists at a pulmonary lab in a community hospital.

Spirometry. To control for diurnal variations, all lung function assessments were conducted between 8:15 and 10:00 AM. Bronchodilator medications were withheld prior to spirometric assessments (e.g., β_2 agonists for 8 hours, short-acting Theophyllines for 12 hours, long-acting Theophyllines for 24 hours, and Atrovent for 12 hours). Two flow-volume loops (FVL), separated by 2 metered inhaled doses of a bronchodilator (Ventolin) and a 10 minute waiting period, assessed reversibility of bronchoconstriction. Measurements included: FEV_1, peak expiratory flow rate (PEFR), and $FEF_{25-75\%}$.

FEV_1 has very good reproducibility and is the best pulmonary function variable for monitoring airways obstruction (Enright, Lebowitz, & Cockroft, 1994). Improvement in parameters of lung function following a bronchodilator suggests bronchospasm is at least partly involved in the airway obstruction (Kelley, 1995). Post-bronchodilator FEV_1 provides a measure of lung function in which daily factors of bronchospasm, such as exposure to environmental stimuli are minimized (Enright et al.). Post-bronchodilator changes in FEV_1 may be minimal or non-existent in those with mild or severe airways obstruction. With mild obstruction, airways may be near or at maximal dilation. In the case of severe obstruction, edema and secretions plug the small airways. (Enright et al.). $FEF_{25-75\%}$ reflects small airways calibre (Cotes, 1993).

Lung volumes. Helium dilution (oxygen consumption method) was used to determine slow vital capacity (SVC), residual volume (RV), total lung capacity (TLC), and RV/TLC. RV, the volume remaining in the lung following maximal exhalation, is effected by elasticity of the thoracic cage and closure of the small airways (Cotes, 1993) With increases in airways obstruction, increases first in RV, then TLC, may occur as a result of air trapping (premature closure of small airways during exhalation). Abnormal

RV or TLC may be the only abnormality of pulmonary function in cases of asthma that are symptom free (Enright et al., 1994). Increases in TLC indicate hyperinflation and can result in discomfort in breathing (Enright et al.).

Diffusion capacity. Single breath diffusing capacity measured with carbon monoxide (DL_{CO}) was assessed using an air mixture composed of 0.3% carbon monoxide, 10% helium, 21% oxygen, and the balance nitrogen. DL_{CO} and DL_{CO}/V_A is useful in ruling out pulmonary diseases other than asthma, and is believed not to be a useful measure of asthma severity (Enright et al., 1994).

Prediction equations. Predicted values were calculated according to the following norms: FEV_1 and $FEF_{25-75\%}$ (Morris, Koski, & Johnson, 1971); PEFR (Cherniak & Raber, 1972); SVC (Goldman & Becklake, 1959); RV, TLC, and RV/TLC (Crapo, Morris, Clayton, & Nixon, 1982), and DL_{CO} (Miller et al., 1983).

Asthma diary. Asthma diaries were used during baseline and treatment periods to record a variety of data on a daily basis. Each participant was given a mini-Wright peak flow meter and instructed as to its correct use by a qualified respiratory therapist. Participants were instructed to record PEFR with the PFM prior to bronchodilator use, upon waking (AM) and at bedtime (PM) (highest of 3 trials), at approximately the same time each day (± 30 minutes). PEFR is an index of large airway obstruction (Burns, 1979). Increased obstruction is reflected in a morning decline, or "dip", in PEFR (Enright et al., 1994).

Self-ratings of symptom severity were recorded daily using a 0-4 scale (0 = no symptoms, 1 = mild, 2 = moderate, 3 = severe, 4 = very severe). Symptoms included: morning wheeze, daytime wheeze, dry cough, cough with expectoration, shortness of breath, chest tightness or discomfort, night or early morning waking, and "had to take a rest". Participants were also instructed to record daily, their medication usage and frequency of home practice of the treatment.

Procedure

Design sequence. Following pre-screening for selection criteria, patients at the respiratory clinic were provided with a detailed written explanation of the study (see Patient Information Sheet, Appendix E). Volunteers were scheduled for spirometry to confirm their eligibility to participate and provide baseline data. During this first visit (S1), asthma diaries and PFM's were provided along with instructions in their use. Each participant demonstrated proper use of their PFM during this and subsequent visits. This provided an opportunity to provide instruction and correction in the use of the PFM, and reinforce the importance of this measurement. Three to 4 weeks after S1, a second assessment of lung function (S2) marked the end of baseline and beginning of the 8 week treatment phase. Spirometry was also conducted after 4 weeks of treatment (S3), and at the conclusion of treatment (S4). In addition, TLC and DL_{CO} were assessed during S1 and S4. The first 4 treatment sessions, between S2 and S3, will be referred to as T1. The last four treatment sessions, between S3 and S4, will be referred to as T2.

Treatment. Individual training sessions of 1 to 1.5 hours in length were conducted by the researcher at the Faculty of Education Clinical Services, University of Alberta. The treatment protocol was based on descriptions of clinical practice (e.g., Achterberg et al., 1994; Hall, 1990; Norris, 1989; Siegel, 1986; Simonton et al., 1978) and psychoneuroimmunology research (e.g., Hall et al., 1992; Rider & Achterberg, 1989).

In session 1, case history was obtained and a script preparing the participant for the treatment process was read. Participants were instructed to draw representations of what asthma and asthma medications mean to them.

In sessions 2 and 3, participants were given an explanation of the pathophysiology of asthma and suggestions of physical changes that are associated with increased lung function in individuals with asthma. Information for this education phase was based on current medical literature (for e.g., Bousquet, 1990; Dolovich & Hargreave, 1992; Godard, Chanez, Redier, Bousquet, & Michel, 1994; Monteleone, 1994; Murray, 1995;

Roitt, Brostoff, & Male, 1993; Walker & Virchow, 1993). Participants were asked how they would imagine these desirable changes in any way that is meaningful to them. The desired changes included: (a) blocking the allergen-antibody complex which functions as an initial trigger for the release of mediators and proteins; (b) blocking infiltration and recruitment of immune and inflammatory cells such as T-cells and eosinophils through a decrease in their activation and adhesive capacity; (c) blocking infiltration of immune and inflammatory cells such as T-cells and eosinophils through a decrease in the activation of endothelial cells; (d) blocking the release of eosinophil-derived cytotoxic proteins through a decrease in inflammatory cell activation; (e) relaxation of the smooth muscles surrounding the bronchi; (f) reduction in the production of mucus; and increased removal of mucus that is present, through thinning of the mucus, ciliary action, and efficient coughing. The participants also developed images representing healing; healthy, clear, and open airways; and an overall image of themselves as vibrant and healthy, doing desired activities and tasks without difficulty breathing. The imagery developed by the participants could be realistic or metaphorical, and could include visual images, sounds, and/or physical sensations. Participants were encouraged to draw their imagery to aid in its development. Drawing materials were provided for this purpose.

In sessions 4 through 8, a standardized relaxation induction was used to facilitate a state of relaxation and focused attention immediately prior to instructions to imagine the desired imagery. The intervention was practiced in a quiet environment, typically with the participant seated in a comfortable chair. A 30 minute audio taped script was provided for home practice. Participants were encouraged to practice a minimum of once per day with the audio tape, and as desired for brief periods without the assistance of the audio tape. The beginning of each session was dedicated to discussing any relevant participant experiences and changes in imagery.

Results

The results of the present study showed that some measure of improvement compared to baseline occurred in all three cases. A significant "baseline to treatment" increase in post-bronchodilator FEV_1 and $FEF_{25-75\%}$ was observed in Case 3. A significant decrease in RV occurred in Case 2. Increases in AM PEFR were evident in Cases 1 and 3. Finally, improvement in daily self-reported symptoms occurred in all 3 cases. The results of the present study are anecdotal and cannot be generalized.

According the ATS (1991) the amount of change in pulmonary function required to be significant from week to week in normal subjects is ≥11 for SVC, ≥ 12 for FEV_1, and ≥ 21 for $FEF_{25-75\%}$. Due to measurement variability, real change is more likely to be indicated by a trend in serial measurements than a change between two measures (ATS). As well, statistically insignificant trends may be clinically meaningful (ATS). Although many studies use 15% as a criterion for significant change, treatments targeting airway inflammation are not expected to effect the same degree of change in pulmonary function as is seen with bronchodilators (Sykes & Cocchetto, 1992).

For this study, significant change will be considered to be indicated by a ≥ 21% change for $FEF_{25-75\%}$, and a change ≥15% for all other pulmonary function parameters. Changes ≤15% will be presented when they illustrate trends or contribute to clinical interpretation. Spirometric data will be supported by graphical representations of trends in PEFR and symptom scores. AM PEFR is displayed with 95% confidence intervals around the means for Baseline, T1, and T2. Due to the within-subject design of this exploratory study, and the heterogeneity of the subjects, the results for each subject will be presented on a case by case basis.

In Case 1, there were non-significant "baseline to treatment" increases in pre-bronchodilator FEV_1 (Table 3-1). A trend of decreasing reversibility is seen in FEV_1.

Table 3-1
Spirometric data for Case 1.

	Lung function assessments							
	Baseline		Treatment		"Baseline to treatment" change			
Measure	S1	S2	S3	S4	S1 to S3	S2 to S3	S1 to S4	S2 to S4
Pre-bronchodilator								
FEV_1 (L)	1.45	1.45	1.52	1.48	5%	5%	2%	2%
PEFR (L/s)	5.31	5.22	5.48	5.77	3%	5%	9%	11%
$FEF_{25-75\%}$ (L/s)	0.57	0.64	0.58	0.61	2%	-9%	7%	-5%
SVC (L, BTPS)	2.97			3.02			2%	
RV (L, BTPS)	2.79			3.00			8%	
TLC (L, BTPS)	5.76			6.02			5%	
RV/TLC	0.48			0.50			4%	
DL_{CO}/V_A	2.54			2.69			6%	
Post-bronchodilator[a]								
FEV_1	1.75	[illegible]	[illegible]	1.59	1%	8%	-9%	-2%
PEFR	6.01	[illegible]	[illegible]	5.46	-7%	3%	-9%	1%
$FEF_{25-75\%}$	0.72	0.67	0.75	0.66	4%	12%	-8%	-1%
Reversibility[b]								
FEV_1	21%	12%	16%	7%	-5%	4%	-14%	-5%
PEFR	13%	4%	1%	-5%	-12%	-3%	-18%	-9%
$FEF_{25-75\%}$	26%	5%	29%	8%	3%	24%	-18%	3%

Note. FEV_1 = forced expiratory volume in one second; PEFR = peak expiratory flow rate; FEF 25-75% = mean forced expiratory flow between 25% and 75% of the expired vital capacity; SVC = slow vital capacity; RV = residual volume; TLC = total lung capacity; DL_{CO}/V_A = diffusing capacity (ml/m/mm Hg)/alveolar ventilation per minute (BTPS).
[a]Measures taken 10 min following the administration of 2 metered inhaled doses of Ventolin.
[b]Percent change between pre-bronchodilator and post-bronchodilator measures.

There were upward trends in pre-bronchodilator PEFR, and AM and PM PEFR recorded on the asthma diary (Figure 3-1). Based on 95% confidence intervals, mean AM PEFR for both T1 and T2 were significantly higher than the mean at baseline. The means for T1 and T2 were not significantly different from each other.

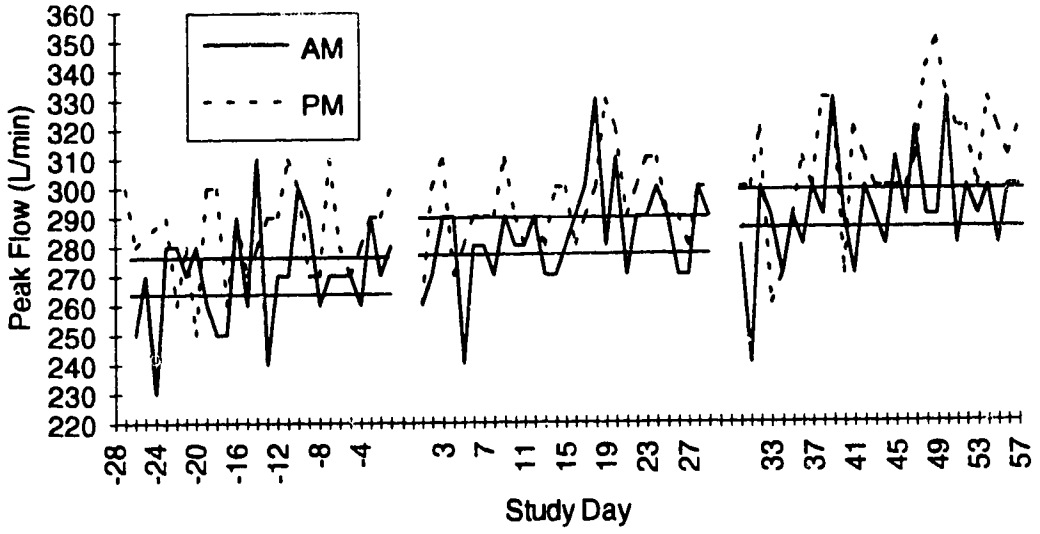


Figure 3-1. Case 1. AM and PM peak expiratory flow rates. Baseline = days -28 to -1. Treatment sessions 1 to 4 = days 1 to 29. Treatment session 5 to 8 = days 30 to 57. Upper and lower limits of 95% confidence intervals around the mean AM PEFR for each phase is indicated by horizontal lines.

Self-reported symptom severity decreased from baseline slightly during T1, and more notably during T2 (Figure 3-2).

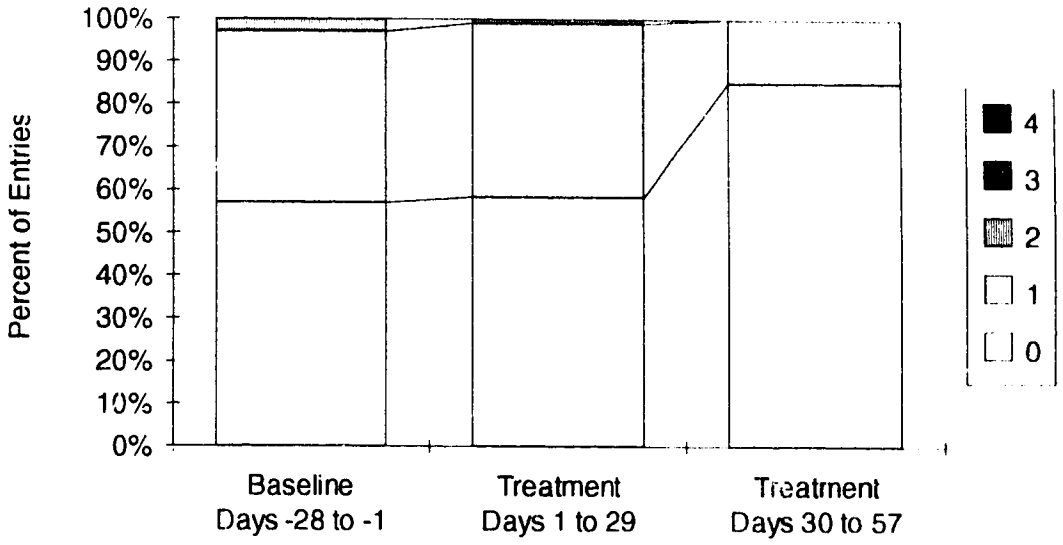


Figure 3-2. Case 1. Self-reported ratings of symptom severity (0 = no symptoms, 1 = mild, 2 = moderate, 3 = severe, 4 = very severe).

Percent of entries in the asthma diary that indicated no symptoms ("0") increased from 52% at baseline and T1, to 75% in T2. For example, 57% of days during the baseline were reported as symptom free days in the category of "shortness of breath", vs. 65% and 89% during T1 and T2, respectively. In the category "had to take a rest", 68% of days were reported as symptom free at base line vs. 86% and 100% during T1 and T2, respectively. Reliever medication was available on an as needed basis, but was not used during this study. DL_{CO}/V_A was abnormally low, but remained consistent at 57%prd and 60%prd, for S1 and S4 respectively.

In Case 2, there was a 17% decrease in RV and RV/TLC, from 131%prd to 109%prd between S1 and S4 (Table 3-2). An 11% increase in SVC, from 99%prd to 110%prd, is also seen between S1 and S4.

Table 3-2
Spirometric data for Case 2.

	Lung function assessments							
	Baseline		Treatment		"Baseline to treatment" change			
Measure	S1	S2	S3	S4	S1 to S3	S2 to S3	S1 to S4	S2 to S4
Pre-bronchodilator								
FEV_1 (L)	2.2	2.14	2.12	2.24	-4%	-1%	2%	5%
PEFR (L/s)	8.91	8.82	9.4	9.16	5%	7%	3%	4%
$FEF_{25-75\%}$ (L/s)	1.22	1.13	1.15	1.29	-6%	2%	6%	14%
SVC (L, BTPS)	3.28			3.65			11%	
RV (L, BTPS)	2.27			1.89			-17%	
TLC (L, BTPS)	5.56			5.54			0%	
RV/TLC	0.41			0.34			-17%	
$DLCO/V_A$	3.82			3.35			-12%	
Post-bronchodilator[a]								
FEV_1	2.39	2.34	2.26	2.35	-5%	-3%	-2%	0%
PEFR	9.68	9.3	10.01	10.05	3%	8%	4%	8%
$FEF_{25-75\%}$	1.56	1.38	1.32	1.48	-15%	-4%	-5%	7%
Reversibility[b]								
FEV_1	9%	9%	7%	5%	-2%	-2%	-4%	-4%
PEFR	9%	5%	6%	10%	-3%	1%	1%	5%
$FEF_{25-75\%}$	28%	22%	15%	15%	-13%	-7%	-13%	-7%

Abbreviations and notes as in table 3-1.

FEV_1, an index of upper airways obstruction, was relatively stable with high %prd values throughout the study, ranging from 83%prd to 88%prd. There were non-significant "baseline to treatment" increases in pre- and post-bronchodilator PEFR. For example, pre-bronchodilator PEFR increased from 146%prd and 145%prd at S1 and S2, to 154%prd and 151%prd at S3 and S4. Low values for $FEF_{25-75\%}$ were obtained, ranging

from 38%prd to 44%prd. Trends towards decreasing reversibility is seen in FEV_1 and more notably in $FEF_{25-75\%}$. Based on 95% confidence intervals there were no significant differences between AM PEFR means (Figure 3-3).

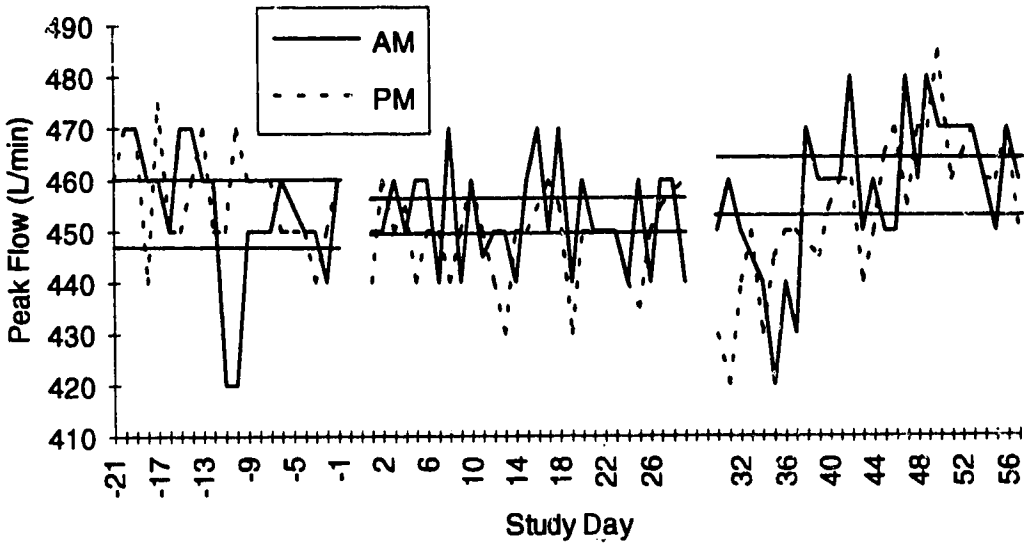


Figure 3-3. Case 2. AM and PM peak expiratory flow rates. Baseline = days -21 to -1. Treatment sessions 1 to 4 = days 1 to 29. Treatment session 5 to 8 = days 30 to 57. Upper and lower limits of 95% confidence intervals around the mean AM PEFR for each phase is indicated by horizontal lines.

Self-reported symptom severity decreased from baseline during both T1 and T2 (Figure 3-4).

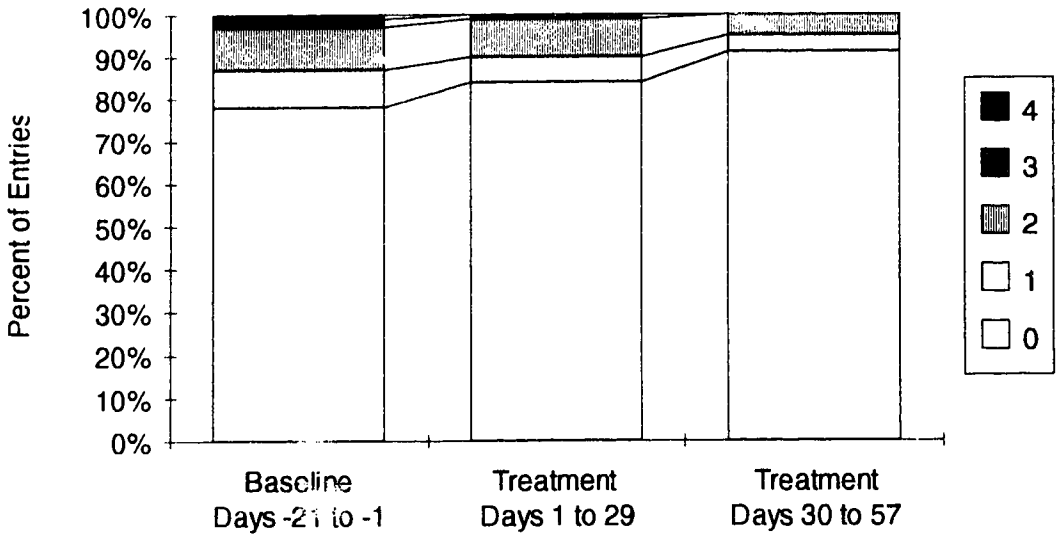


Figure 3-4. Case 2. Self-report ratings of symptom severity (0 = no symptoms, 1 = mild, 2 = moderate, 3 = severe, 4 = very severe).

Percent of "0" entries increased from 78% at baseline, to 83% and 91% during the T1 and T2, respectively. The majority of entries indicating the presence of symptoms were in the categories "chest tightness or discomfort" and "shortness of breath". No symptoms were reported in the categories of morning wheeze, daytime wheeze, or cough with expectoration. Reliever medication (Ventolin) was used on two occasions during baseline and once during treatment.

Case 3 was unique in that he was diagnosed with a respiratory infection on day 20. He was treated between day 20 and 40 with two courses of antibiotics and a nasal decongestant. On day 47 he reported that an increase in symptom severity associated with the respiratory infection had subsided. He participated in a residential move between days 53 and 60, and reported an increase in symptoms associated with a substantial increase in

his level of physical activity during this time. There were non-significant "baseline to treatment" increases in pre-bronchodilator FEV_1, PEFR, and $FEF_{25-75\%}$ (Table 3-3).

Table 3-3
Spirometric data for Case 3.

	Lung function assessments							
	Baseline		Treatment		"Baseline to treatment" change			
Measure	S1	S2	S3	S4	S1 to S3	S2 to S3	S1 to S4	S2 to S4
Pre-bronchodilator								
FEV_1 (L)	1.54	1.49	1.62	1.62	5%	9%	5%	9%
PEFR (L/s)	7.16	6.27	7.34	7.71	3%	17%	8%	23%
$FEF_{25-75\%}$ (L/s)	0.53	0.61	0.66	0.64	25%	8%	21%	5%
SVC (L, BTPS)	3.87			3.9			1%	
RV (L, BTPS)	3.3			3.46			5%	
TLC (L, BTPS)	7.17			7.36			3%	
RV/TLC	0.46			0.47			2%	
DL_{CO}/V_A	4.91			4.35			-11%	
Post-bronchodilator[a]								
FEV_1	1.5	1.52	1.79	1.74	19%	18%	16%	14%
PEFR	7.34	6.92	6.9	8.03	-6%	0%	9%	16%
$FEF_{25-75\%}$	0.56	0.6	0.84	0.67	50%	40%	20%	12%
Reversibility[b]								
FEV_1	-3%	2%	10%	7%	13%	8%	10%	5%
PEFR	3%	10%	-6%	4%	-9%	-16%	1%	-6%
$FEF_{25-75\%}$	6%	-2%	27%	5%	21%	29%	-1%	7%

Abbreviations and notes as in table 3-1.

There was a significant increase (18%) in post-bronchodilator FEV_1 from the highest point at baseline (S2) to S3, and a non-significant increase (14%) between S2 and S4. There was a notable "baseline to treatment" increase in reversibility of FEV_1. A 40% increase in post-bronchodilator $FEF_{25-75\%}$ occurred between S2 and S3. Based on 95%

confidence intervals around mean AM PEFR, the means of T1 and T2 were significantly higher than baseline, but were not significantly different from each other (Figure 3-5).

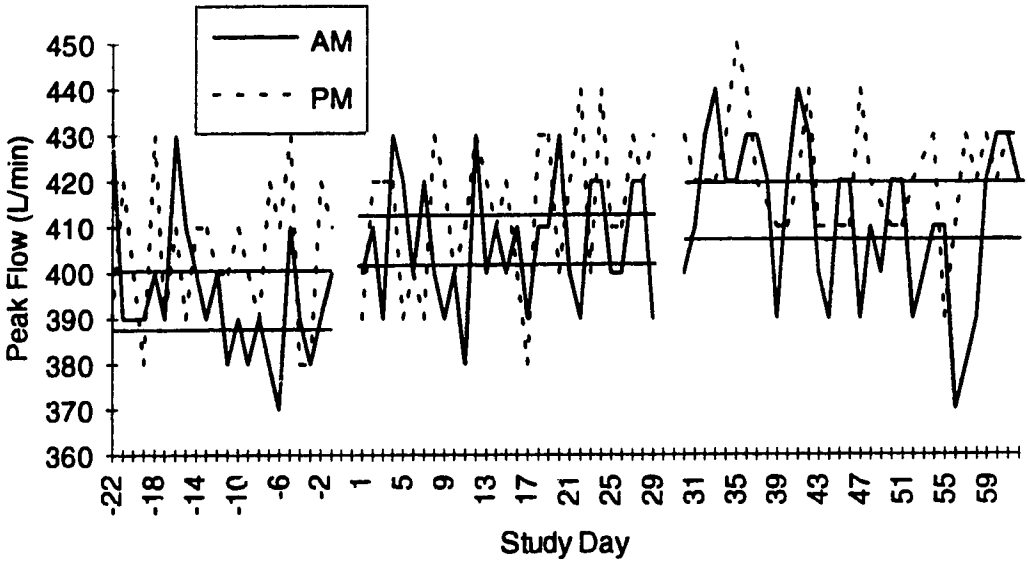


Figure 3-5. Case 3. AM and PM peak expiratory flow rates. Baseline = days -22 to -1. Treatment sessions 1 to 4 = days 1 to 29. Treatment session 5 to 8 = days 30 to 62. Upper and lower limits of 95% confidence intervals around the mean AM PEFR for each phase is indicated by horizontal lines.

Percentage of entries recorded in the asthma diary as "severe" began at 27% for baseline, increased to 31% for T1, and decreased to 7% for T2 (Figure 3-6).

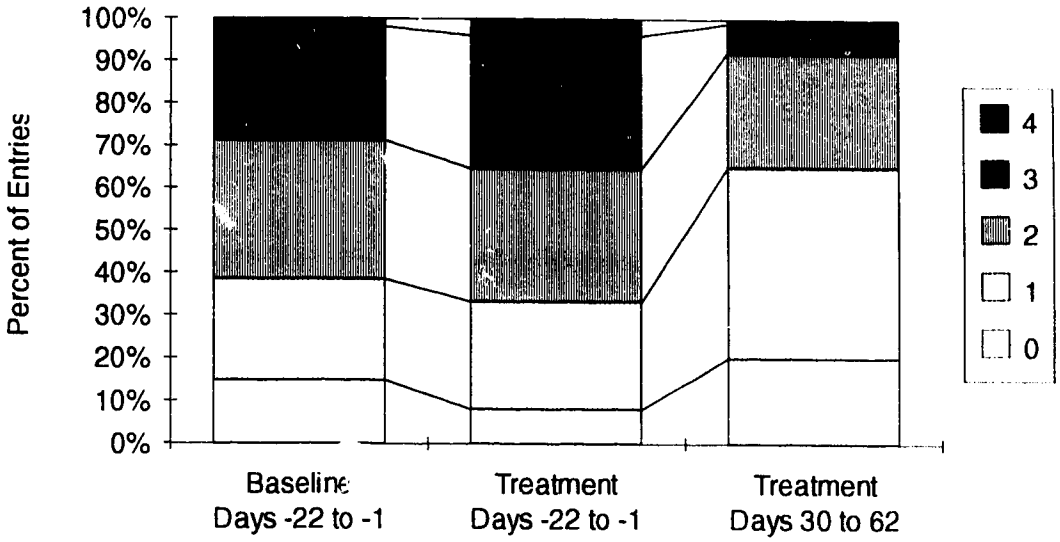


Figure 3-6. Case 3. Self-report ratings of symptom severity (0 = no symptoms, 1 = mild, 2 = moderate, 3 = severe, 4 = very severe).

Reliever medication (Ventolin) was used 5 times during baseline, 5 times in T1, and 2 times in T2.

Discussion

In case 1, the slight increases in pre-bronchodilator FEV_1 are consistent with the trend of decreasing reversibility of FEV_1. Consistent with the trends in FEV_1 are notable increases in other indices of airways obstruction: pre-bronchodilator PEFR, and daily measures of AM and PM PEFR. The improvements in lung function parameters, supported by decreases in self-reported symptom severity, suggest that decreases in airways obstruction occurred during the treatment period.

In case 2, there appeared to be minimal upper airways obstruction, indicated by high FEV_1 and PEFR %prd and lack of symptoms in the categories of wheeze. Minimal involvement of bronchoconstriction is suggested by low reversibility values for FEV_1 and

PEFR. These factors may explain the lack of significant change in AM PEFR: there may be little room for improvement. Abnormal $FEF_{25-75\%}$ values are suggestive of small airways obstruction. Decreases in reversibility of $FEF_{25-75\%}$ is consistent with decreases in RV. As it is unlikely that a change in elasticity would occur during the short length of this study, the decrease in RV is suggestive of a decrease in obstruction of the small airways. The increase in SVC is consistent with the decrease in RV since vital capacity should increase as premature airways closure (air trapping) decreases.

In case 3, increases in pre-bronchodilator FEV_1, PEFR, and $FEF_{25-75\%}$, though not significant, suggest decreased airways obstruction. The significant and near significant changes in post-bronchodilator FEV_1 provide strong evidence of decreased airways obstruction. As noted earlier, minimal reversibility may occur with severe airways obstruction. Thus, the increase in reversibility also provides evidence of a decrease in airways obstruction. Increases in daily PEFR and decreases in symptom severity are consistent with and corroborate the changes in spirometric measures. The 40% increase in post-bronchodilator $FEF_{25-75\%}$ at S3 is likely related to the concurrent use of antibiotics. A 12% increase in post-bronchodilator $FEF_{25-75\%}$ at S4 is more consistent with changes seen in other lung function parameters. Increased percentages of "severe" and "very severe" categories of symptom severity in T1 are consistent with a respiratory infection. The increase in AM PEFR in T1 and post-bronchodilator FEV_1 in S3, is surprising considering the increase in "severe" and "very severe" symptoms that correspond with the occurrence of the respiratory infection during that time period.

For all cases, reliever medications were used either infrequently or not at all. In Case 3, Ventolin use remained constant from baseline to T1 despite the presence of a respiratory infection, and decreased in T2, despite it being a period of increased physical activity due to a residential move. These changes are only slight, and may have occurred by chance.

In all three case, non-significant decreases were seen in various lung function parameters during baseline (S1 to S2). All "baseline to treatment" changes reported above were based on the highest of the two baseline values. If two baseline assessments were not used in this study, instead relying on the assessment immediately prior to the beginning of treatment, significant changes in pre-bronchodilator PEFR and $FEF_{25-75\%}$ would have been reported in Case 3.

This study expands on previous research on psychological treatments of asthma by including RV, TLC, DL_{CO}, and assessment of reversibility as outcome measures. The results of this study suggest that change may occur in a wide variety of outcome measures. Previous research that utilized limited outcome measures may have failed to detect treatment related changes, discouraging further research in that area. For example, in case 1, if only pre-bronchodilator FEV_1 and symptom severity had been assessed, it might be argued that the perception of symptoms was altered without any change in lung function--an undesirable situation. However, the use of additional outcome measures provides evidence that changes in airways obstruction did occur.

lts of this study, though anecdotal, suggest that further controlled research
t approach is warranted. Public use of complementary treatment
lespread. Thorough evaluation of these approaches may facilitate an
the part of the public, and influence if and how practitioners utilize

References

Achterberg, J., Dossey, B., & Kolkkmeier, L. (1994). Rituals of healing: Using imagery for health and wellness. NY: Bantam.

Aronoff, G. M., Aronoff, S., & Peek, L. W. (1975). Hypnotherapy in the treatment of bronchial asthma. Annals of Allergy, 34, 356-362.

American Thoracic Society. (1991). Lung function testing: Selection of reference values and interpretative strategies. American Review of Respiratory Disease, 144, 1202-1218.

American Thoracic Society. (1987). Standardization of spirometry - 1987 update. American Review of Respiratory Disease, 136, 1285-1298.

Beasley, R., Roche, W. R., Roberts, J. A., & Holgate, S. T. (1989). Cellular events in the bronchi in mild asthma and after bronchial provocation. American Review of Respiratory Disease, 139, 806-817.

Bergner, A., & Bergner, R. K. (1994). The international consensus report on diagnosis and treatment of asthma: A call to action for US practitioners. Clinical Therapeutics, 16(4), 694-706.

Bolton, R. A. (1991). Nongenital warts: Classification and treatment options. American Family Physician, 43, 2049-2056.

Bousquet, J., et al. (1990). Eosinophilic inflamation in asthma. The New England Journal of Medicine, 323(15), 1033-1039

Brown, D.P., & Fromm, E. (1988). Hypnotic treatment of Asthma. Advances, 5(2), 15-27.

Burns, K. L. (1979). An evaluation of two inexpensive instruments for assessing airway flow. Annals of Allergy, 43, 246-249.

Cherniack, R., & Raber, M. (1972). Normal standards for ventilatory function using an automated wedge spirometer. American Review of Respiratory Disease, 106, 38-46.

Cluss, P. A., & Fireman, P. (1985). Recent trends in asthma research. Annals of Behavioral Medicine, 7(4), 11-16.

Cotes, J. E. (1993). Lung function: Assessment and application in medicine (5th ed.). Oxford, England: Blackwell Scientific Publications.

Crapo, R. O., Morris, A. H., Clayton, P. D., & Nixon, C. R. (1982). Lung volumes in healthy nonsmoking adults. Bulletin Europeen de Physiopathologie Respiratoire, 18, 419-425.

Dolovich, J., & Hargreave, F. E. (1992). Airway mucosal inflammation. Journal of Asthma, 29(3), 145-149.

Eisenberg, D. M., Kessler, R. C., Foster, C., Norlock, F. E., Calkins, D. R., & Delbanco, T. L. (1993). Unconventional medicine in the United States--Prevalence, costs, and patterns of use. The New England Journal of Medicine, 328(4), 246-252.

Enright, P. L., Lebowitz, M. D., & Cockroft, D. W. (1994). Physiologic measures:Pulmonary function tests. American Journal of Respiratory Critical Care Medicine, 149, S9-S18.

Erickson, M. H. (1977). Control of physiological functions by hypnosis. The American Journal of Clinical Hypnosis, 20(1), 8-19.

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

Godard, PH., Chanez, P., Redier, H., Bousquet, J., & Michel, F. B. (1994). New therapeutic approaches in the treatment of asthma. Annals of the New York Academy of Sciences, 725, 367-377.

Goldman, H., & Becklake, M. (1959). Normal values at median altitudes and the prediction of normal results. American Review of Tuberculosis and Pumonary Disease, 79, 457-467.

Hall, H. (1990). Imagery, psychoneuroimmunology, and the psychology of healing. In R. G. Kunzendorf & A. A. Sheikh (Eds.), The Psychophysiology of Mental Imagery: Theory, Research and Application (pp.203-227). Amityville, NY: Baywood

Hall, H., Minnes, L., Tosi, M., & Olness, K. (1992). Voluntary modulation of neutrophil adhesiveness using a cyberphysiologic strategy. International Journal of Neuroscience, 63, 287-297.

Hall, H., Papas, A., Tosi, M., & Olness, K. (1995). Directional changes in neutrophil adherence following passive-resting vs. active-imaging. (submitted).

Isenberg, S. A., Lehrer, P. M., & Hochron, S. (1992). The effects of suggestion on airways of asthmatic subjects breathing room air as a suggested bronchoconstrictor and bronchodilator. Journal of Psychosomatic Research, 36(8), 769-776.

Johnson, R. F. Q., & Barber, T. X. (1978). Hypnosis, suggestions, and warts: An experimental investigation implicating the importance of "believed-in efficacy". The American Journal of Clinical Hypnosis, 20(3), 165-174.

Kelly, M. A. The physiological basis of pulmonary function testing. In M. A. Grippi (Ed.), Lippincott's Pathophysiology Series: Pulmonary Pathophysiology (pp. 53-76). Philadelphia: J. B. Lippincott Company.

Kershaw, C. J. (1987). Therapeutic metaphor in the treatment of childhood asthma: A systemic approach. In S. R. Lankton (ed.), Central Themes and Principles of Ericksonian Therapy. (pp. 56-68). NY: Bruner/Mazel.

Kiecolt-Glaser, J.K., & Glaser, R. (1988). Methodological issues in behavioral immunology research with humans. Brain, Behavior, and Immunity, 2, 67-78.

Lane, D. J. (1994). What can alternative medicine offer for the treatment of asthma? Journal of Asthma, 31(3), 153-160.

Lask, B. (1991). Psychological treatments of asthma. Clincial and Experimental Allergy, 21, 625-26

Lehrer, P. M., Hochron, S. M., McCann, B., Swartzman, L., & Reba, P. (1986). Relaxation decreases large-airway but not small-airway asthma. Journal of Psychosomatic Research, 30(1), 13-25.

Mendelberg, H. A. (1990). Hypnosis with a depressed, suicidal, asthmatic girl. Psychotherapy in Private Practice, 8(3), 41-48.

Miller, A., Thornton, J. C., Warshaw, R., Anderson, H., Teirstein, A. S., & Selikoff, I. J. (1983). Single breath diffusing capacity in a representative sample of the population of Michigan, a large industrial state. American Review of Respiratory Disease, 127(3), 270-277.

Monteleone, C. A. (1994). Allergy. In L. H. Signal & Y. Roy (Eds.), Immunology and Inflammation: Basic Mechanisms and Clincal Consequences (pp.537-584).

Moore, N. G. (1995). The Simonton Cancer Centre: Using the mind-body approach against cancer. Alternative Therapies, 1(5), 24-25.

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

Moyers, B. D. (1993). Healing and the mind. New York: Doubleday.

Mrazek, D. A., & Klinnert, M. (1991). Asthma: Psychoneuroimmunologic considerations. In R. Ader, D. L. Felton, & N. Cohen (Eds.), Psychoneuroimmunology (pp.1013-1035). New York: Academic Press.

Murray, R. K. (1995). Mechanisms of bronchoconstriction and asthma. In M. A. Grippi (Ed.), Lippincott's Pathophysiology Series: Pulmonary Pathophysiology (pp. 77-92). Philadelphia: J. B. Lippincott Company.

Norris, P. A. (1989). Clinical psychoneuroimmunology: Strategies for self-regulation of immune system responding. In J. V. Basmajian (Ed.), Biofeedback Principles and Practice for Clinicians (3rd ed.) (pp. 57-66). Baltimore, MD: Williams & Wilkins.

Olness, K., Culbert, T., & Uden, D. (1989). Self regulation of salivary immunoglobulin A by children. Pediatrics, 83(1), 66-71.

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

Richter, R., & Dahme, B. (1982). Bronchial asthma in adults: There is little evidence for the effectiveness of behavioral therapy and relaxation. Journal of Psychosomatic Research, 26(5), 533-540.

Rider, M. S., & Achterberg,. J. A. (1989). Effects of Music-Assisted Imagery on Neutrophils and Lymphocytes. Biofeedback and Self-Regulation, 14(3), 247-57.

Rider, M. S., & Weldin, C. (1990). Imagery, improvisation, and immunity. The Arts in Psychotherapy, 17, 211-216.

Roitt, I., Brostoff, J., & Male, D. (1993). Immunology (3rd ed.). St. Louis, MO: Mosby.

Rossi, E. (1993). The Psychobiology of Mind-Body Healing (2nd ed.). NY: Norton.

Rowe, W. S. G. (1982). Hypnotherapy and plantar warts. Austrailian and New Zealand Journal of Psychiatry, 16, 304.

Sheehan, D. V. (1978). Influence of psychosocial factors on wart remission. The American Journal of Clinical Hypnosis, 20(3), 160-164.

Siegel, B. S. (1986). Love, medicine & miracles: Lessons learned about self-healing from a surgeon's experience with exceptional patients. NY: Harper & Row.

Simonton, O. C., Matthews-Simonton, S., & Creighton, J. L. (1978). Getting well again: A step-by-step, self-help guide to overcoming cancer for patients and their families. NY: Bantam Books.

Smith, G. R., Conger, C., O'Rourke, D. F., Steele, R. W., Charlton, R. K., & Smith, S. S. (1992). Psychological modulation of the delayed type hypersensitivity skin test. Psychosomatics, 33(4), 444-451.

Smith, G. R., McKenzie, J. M., Marmer, D. J., & Steele, R. W. (1985). Psychologic modulation of the human immune response to varicella zoster. Achives of Internal Medicine, 145, 2110-2112.

Spanos, N. P., Stenstrom, R. J., & Johnston, J. C. (1988). Hypnosis, placebo, and suggestion in the treatment of warts. Psychosomatic Medicine, 50, 245-260.

Spanos, N. P., Williams, V., & Gwynn, M. I. (1990). Effects of hypnotic, placebo, and salicylic treatments on wart regression. Psychosomatic Medicine, 52, 109-114.

Sykes, R. S., & Cocchetto, D. M. (1992). Antiasthma drugs: Key issues in clinical trial methodology. Journal of Asthma, 29(2), 79-90.

Tasini, M. F., & Hackett, T. P. (1977). Hypnosis in the treatment of warts in immunodeficient children. The American Journal of Clinical Hypnosis, 19(3), 152-154.

Vazquez, M. I., & Buceta, J. M. (1993). Psychological treatment of asthma: Effectiveness of a self-management program with and without relaxation training. Journal of Asthma, 30(3), 171-183.

Walker, C., & Virchow, J. -C. (1993). T-cells and endothelial cells in asthma. Allergy, 48, 24-31.

Zachariae, R., Kristensin, J. S., Hokland, P., Ellegaard, J., Metze, E., & Hokland, M. (1990). Effect of psychological intervention in the form of relaxation and guided imagery on cellular immune function in normal healthy subjects. Psychotherapy and Psychosomatics, 54(1), 32-39.

CONCLUSION

The goals of this pilot st dy were to (a) investigate the efficacy of a psychological intervention involving imagery as an adjunct treatment for asthma, and (b) refine the treatment protocol for use in a future controlled study. Within the limitations of the experimental design and the small numbers of subjects, the goals of this study appear to have been achieved.

Objective and subjective data (paper 3) and participant experiences (paper 2) suggest that the all three participants improved in one or more areas of symptoms, daily peak expiratory flow, or periodic spirometric assessment of lung function. Significant changes did not occur in two commonly used measures: pre-bronchodilator forced expiratory flow in 1 sec and vital capacity.

At this time, it is not possible to conclude if any physiological changes were effected by the imagery used in this study. Although, considering previous research on intentional immunomodulation (paper 1), it is a possibility. Further research on this issue is required.

Clinical observations and participant experiences provided valuable information that can now be used to refine the treatment protocol. Based on the findings of this study, further research on the use of imagery as an adjunct treatment for asthma is warranted. This pilot study was an important step forward in the critical examination of a widely used complementary treatment.

APPENDIX A

Session 1

Introduction

(Initial greeting, request pre-session peak flow reading, thank for participating, and general conversation to establish rapport)

Questions

How long have you had asthma? How has it effected your life? How have you controlled your asthma? Have you tried to use you mind to control your asthma in any way? Do you believe it is possible for the mind to influence the body? Why? What are the positive consequences of controlling your asthma? What are the negative consequences of controlling you asthma? Address any stated reservations.

Read Modified Versions of Hall's (1990) Pre-Treatment Script

(Script is intended to allay misconceptions or fears, emphasize "allowing" the experience to happen rather than "trying", elicit modality preferences, elicit calm imagery, and prepare for the upcoming experience).

Closure

(Explain and provide the participant with "Homework Instructions: Session 1" Request post session peak flow reading.)

Homework Instructions: Session 1 (Presented orally and provided as a handout.)

At home, take several minutes to relax your body from feet to head, think of your calm and relaxed place or time. Most people like to do this with their eyes closed.

When you think of the asthma that you currently have, what image, or images, comes to your mind. The image that develops can include pictures, sounds, smells, tastes, and/or feelings develop. Take your time, and be receptive to any images that may come into your awareness from your unconscious. Your personal representation of asthma does not need to conform to any drawings or pictures you have seen before. Be creative. Throughout the week, be alert to any images that may come to you when awake or even in your dreams.

Make a drawing, or drawings, of the image as best you can. You will not be evaluated on your artistic ability.

I will provide you with paper and colored pencils. If you wish, you can also write down a description of your experience. Please feel free to use paint or use other art mediums, although it is preferable if you use color.

Go through the same process to develop, then draw, an image of the medication you are currently taking for asthma.

Please bring your drawings to the next session.

APPENDIX B

Session 2

Introduction

(Request pre-session peak flow reading. View and discuss drawings made between sessions.)

Education Script and Generation of Imagery

Even though you may know some things about asthma, I would like to review some important information with you. When you breath in, the air travels through the nose and mouth, and down your trachea (indicate trachea on self), which is commonly known as your windpipe. At the top of the lungs the trachea subdivide into two bronchial tubes, one going to the left lung, the other going to the right lung. The bronchial tubes then subdivide many times into increasingly smaller tubes that have tiny air sacs on the ends where oxygen exchange occurs.

In asthma, the immune system which protects us from bacteria, viruses, and parasites, is over-active. Some of the cells of the immune system, which are meant to protect us from noxious materials, are produced in greater numbers and then gather in the lungs. There they act as if they are protecting the body when there is in fact little if any threat. Their activation cause inflammation of the airways and this in turn results in contraction or spasms of the muscles that surround the airways which make it more difficult to breath.

Image 1: Blocking the allergen-antibody complex which functions as an initial trigger for the release of mediators and proteins. Are you allergic to anything? Allergies are often involved in causing this inflammation. Allergies occur when your immune systems reacts to a foreign substance, such as (insert relevant allergen), that is not usually harmful to the body. These substances are called allergens. The immune system has developed a way of recognizing that the allergen is present, and alerting its cells to take action. The alarm system consists of a molecule called an antibody that recognizes only that one type of foreign substance. There is a class of sticky antibodies that are found tightly bound to the surface of certain immune system cells called mast cells, which are in the tissues of the nose, mouth, and lungs. When the allergen enters the body, the antibody that recognizes it will latch onto it, inducing the cell to release many substances such as histamine and others which cause symptoms like itchy and watery eyes and tightening of the muscles around the airways. These cells also release molecules which alert other cells of the immune system in order to recruit more of them to the site of inflammation and to activate them to release more of their stored chemicals. How would you imagine, in any way that is meaningful for you, your immune system correcting its mistake and no longer

recognizing (insert relevant allergens) as harmful? With the mast cells in the tissues of the lu[illegible] remaining calm and quiet, saving their special chemicals for when they are really needed?

Image 2: blocking infiltration and recruitment of immune and inflammatory cells such as T-cells and eosinophils through a decrease in their activation and adhesive capacity, and blocking infiltration of immune and inflammatory cells such as T-cells and eosinophils through a decrease in the activation of endothelial cells. As mentioned before, the mast cells release messengers that tell other cells of the immune system, which are circulating in the blood, to come to that same location and help. There are a number of different kinds of immune cells that behave in a similar way, we shall refer to them all as white blood cells.

When they are calm, these WBC's travel around the body with the rapid flow of blood just waiting to be called into action. When they receive the recruitment messages, these white blood cells become alert, active, and excited. When they become excited, the WBC's change a [illegible] of important proteins that are on the surface of the cell, so they can act like ante[illegible] cells also send extra molecules of protein from the inside of the cell to its surface to make it even more sticky. The sticky WBC's can then grab on to the wall of the blood vessel, slow down, and begin rolling along the wall of the blood vessel. The walls of the blood vessels in the area where the WBC's have been summoned to, become coated with molecules that are designed to connect with the molecules that have appeared on the surface of the white blood cells. This lets the WBC's know where to stop rolling, and then squeeze through the gaps in the wall of the blood vessel, into the area of tissue they were summoned to. Thus both the walls of the blood vessels and the white blood cells have become sticky.

With asthma, the immune system is over active. It would be desirable if the WBC's ignored the signal to become excited, and if the WBC's and the blood vessels became less sticky. Researchers have already proven that you can make WBC's more or less sticky just by imagining the change you want. This is what we want to do now. How would you imagine your white blood cells and blood vessels becoming less sticky? Can you incorporate the desirable change of the WBC's ignoring the signals?

Image 3: Blocking the release of eosinophil-derived cytotoxic proteins through a decrease in inflammatory cell activation. After the white blood cells stick to the wall of the blood vessel, they squeeze through the wall and move into the tissues of the lung (and nose?) where they release toxic substances that damage the healthy tissues of the lungs.

How would you imagine both the white blood cells that traveled to the tissues of the lungs, and the ones that are normally there, remaining calm and quiet, saving their special protective chemicals for when they are really needed?

Image 4: Relaxation of Smooth Muscle. Narrowing of the airways is partly caused by the tightening of the muscles in the walls of the trachea and bronchial tubes. These muscles can spasm and tighten, reducing the size of the airway. How would you imagine the muscles in the walls of the trachea and bronchial tubes becoming relaxed and loose?

Image 5: Reduction in the production of mucus. Increased removal of mucus that is present, through thinning of the mucus, ciliary action, and efficient coughing.
The airways may become blocked by increases in the amount of mucus. Mucus is produced by small glands that line the airways. The mucus may become thick making it harder to remove by coughing and the sweeping action of the little hairs in the airway called cilia. How would you imagine the glands producing less mucus? How would you imagine the mucus becoming thinner, being swept up and out of the lungs by the cilia, and expectorated by coughing.

Image 6: General healing imagery. Some people find it helpful to have a general image that represents healing. For you, what might that image be? It may be a color, a ball of light, a sound, a feeling or sensation, an event, person, object, or anything else you can imagine.

Image 7a and 7b: End state imagery. I would like you also to develop an image that represents the final healed state with healthy, clear, and open airways; and an overall image of yourself self as vibrant and healthy, doing things that you want to do without difficulty. First, how would you imagine your airways healthy, with clear and open paths? How would you imagine yourself self as vibrant and healthy, doing things that you want to do without difficulty in breathing? (Determine if there are any reservations about the outcome, modify image as necessary. Emphasize that the image should be associated, and it should incorporate as many senses as possible.)

Correction of imagery. (Throughout this script suggestions should be made to ensure the participants imagery is correct in terms of the desired outcome. Ensure that the subject is not caught up in providing technical representations of the desired changes.)

Closure. (Assign homework: request that the participant draw the above self-generated images. Provide participant with "Homework Instructions: Session 2" (Appendix B). Post-session peak flow reading.)

Homework Instructions: Session 2 (Presented orally and provided as a handout.)

1) Draw the imagery developed in this session if you have not already done so.

(a). How would you imagine, in any way that is meaningful for you, your immune system correcting its mistake and no longer recognizing the things you are allergic to as harmful? With the mast cells in the tissues of the lungs, remaining calm and quiet, saving their special chemicals for when they are really needed?
(b). How would you imagine your blood vessels and white blood cells becoming less sticky?
(c). How would you imagine both the white blood cells that traveled to the tissues of the lungs, and the ones that are normally there, remaining calm and quiet, saving their special chemicals for when they are really needed?
(d). How would you imagine the muscles in the walls of the trachea and bronchial tubes becoming relaxed and loose?
(e). How would you imagine the glands producing less mucus?
How would you imagine the mucus becoming thinner, being swept up and out of the lungs by the cilia, and expectorated by coughing.
(f). Some people find it helpful to have a general image that represents healing. For you, what might that image be?
(g). I would like you also to develop an image that represents the final healed state with healthy, clear, and open airways.
(h). Overall image of yourself self as vibrant and healthy, doing things that you want to do without difficulty.
2) Please listen to tape once a day.
3) Some people find it beneficial to practice the imagery for brief periods during the day, especially when you feel some symptoms and when you take your medication. When you take your reliever medications (Ventolin, Berotec, Bricanyl, Alupent, Pro-Air, etc.) imagine the airway muscles relaxing. When you take your maintainer medications, which are the anti-inflammatories (Beclovent, Becloforte, Pulmicort, etc.) imagine your mast cells and white blood cells remaining calm and quiet, saving their special chemicals for when they are really needed.

APPENDIX C

Sessions 3-8

(Request pre-session peak flow. Debrief experiences of the past week, focusing on experiences during home practice of imagery, subjective reports of symptoms, entries into the asthma diary, and drawings. This script was recorded on audio tape and provided to each of the participants for home practice.)

Preparation for in-session treatment.

Prepare for this relaxation and imagery session by finding a quiet, comfortable, peaceful place where you will not be disturbed. Although it is not necessary, you may want to develop a ritual for yourself so that you are practicing in the same place and way each day. You can remember this is your "healing time". You may want to sit in a comfortable chair that provides support for your head. If you choose to lie down, remember that you should not fall asleep during the relaxation and imagery practice. If you find it difficult to remain awake, it is likely a sign that you are in need of more sleep. Practicing earlier in the day when you are less tired may also help you stay awake. Keep some paper and crayons at your side so you can write down or draw any images or insights that may develop. If you decide to do so, you can change the healing imagery that was previously developed. Draw this new imagery and please share it with the researcher in your next session.

Read progressive relaxation script (Hall, 1990, modified to decrease length)

(Script incorporates relaxation, suggestions, and elicitation of classic hypnotic phenomena. The induction protocol "is geared toward creating a psychological ritual that everyone can experience" (Hall, p. 215)).

Calm scene.

And I'd like you to begin allowing your calm scene to develop--as fully as you can--a time, a place--that you feel comfortable and relaxed. You may notice that it is the same as before--or it may have changed in certain ways. And that's just fine. All that is really important--is that you just allow it to happen--and as you begin to notice certain details--of your experience--you may enjoy a growing sense--of comfort--and relaxation--and I wonder if you will enjoy--how naturally you may become aware--of certain sights--sounds--sensations--and you may also imagine smells--and tastes--and emotions that you would feel--you may feel peace--serenity--calmness--or not. I really don't know--and if you wish--you may feel more and more relaxed--and calm--as you allow the image to develop even further--that's right.

Treatment Imagery

(Pause for approximately 1 min following each image).

Image 1. Now I would like you to begin allowing yourself to imagine--in any way that is meaningful for you--your immune system correcting its mistake--and no longer recognizing as harmful--the things you were allergic to--the mast cells in the tissues of the lungs--remaining calm and quiet--they can now save their special chemicals for when they are really needed--fully expecting this to happen--fully expecting that this is happening now--it is possible you may see, feel, hear--taste, and even smell this happening--what ever way is right for you--use the next moments of silence to imagine as fully as possible, your immune system no longer recognizing as harmful, the things you were allergic to--imagining your mast cells--calm and quiet--until you hear my voice again.

Image 2. And now, allow yourself to imagine--as fully as possible--your white blood cells becoming less sticky--and your blood vessels becoming less sticky--however you will imagine this--whatever colors, sounds, feelings there may be--fully expecting it will happen--white blood cells--less sticky--blood vessels--less sticky.

Image 3. Imagine all the white blood cells--in the tissues of the lung--remaining calm and quiet--saving their special chemicals--for when they are really needed.

Image 4. Now, imagine the muscles in the walls of the trachea and bronchial tubes becoming relaxed and loose--muscles becoming relaxed and loose--the airways opening up as they become relaxed and loose. You may notice a change in how they look--how it sounds--and it may even feel differently as the muscles become relaxed and loose.

Image 5. Imagine the mucus glands--lining your airways--producing less mucus--thin mucus--and as the mucus in your lungs becomes thinner, it is swept up and out of the lungs by the cilia where it can be removed by a cough.

Image 6. Now, take a few moments to imagine your general healing image--whatever it may be. What ever to you that represents healing.

Image integration. And now, possibly in a creative and interesting way, allow yourself to combine some or all of these healing images--in any way that is meaningful for you--or you can imagine whatever may be most beneficial for you at this time--go ahead and do that now.

Image 7a. And you can now imagine your lungs as healthy, with clear, and open airways. Imagine what that looks like, feels like, sounds like. Healthy, clear, and open airways.

Image 7b. Imagine yourself s[illegible]ibrant and healthy, doing things that you want to do without difficulty--see it through[illegible] own eyes--fully expect it will happen--notice what you may see, hear, and feel--taste and smell. Experience it as fully as possible. Experience what it is like to be in that healthy you. Notice how things look to you. Notice how it feels to breath.

Reorient. (A script from Hall (1990) containing instructions to reorient using a 10 to 1 count is used on the audio tape. During in-session treatments, instructions to reorient may be shortened to brief suggestions of waking and becoming more alert, taking as much time as is needed.) Take a moment to recall this experience. Draw any changes in your imagery or new imagery that may have developed. Write down any insights or revelations you may have had.

Assign home practice. Please listen to tape once a day. Some people find it beneficial to practice the imagery for brief periods during the day, especially when you feel some symptoms and when you take your medication. When you take your reliever medications (Ventolin, Berotec, Bricanyl, Alupent, Pro-Air, etc.) imagine the airway muscles relaxing. When you take your maintainer medications, which are the anti-inflammatories (Beclovent, Becloforte, Pulmicort, etc.) imagine your mast cells and white blood cells remaining calm and quiet, saving their special chemicals for when they are really needed.

Closure. (Debrief if necessary. Request post session peak flow.)

APPENDIX D

Consent for Patients

Training in Self-Generated Imagery as an Adjunct Treatment to Improve Lung Function in Individuals with Asthma

I acknowledge that the research project described in the preceding information sheet has been explained to me and that any pertinent questions I have asked have been answered to my satisfaction. I have been informed of the alternates to participation in this study and all the known risks and discomforts.

I understand that Keith Zukiwski at 445-1372, or Dr. Barbara Paulson at 492-5298, will answer any additional questions that I have about the research project. Should I decide to withdraw from the study at any time, I may do so without prejudice to my overall care.

I understand that I will receive a copy of the information sheets and this signed consent form, and that this project may be reported, but I will not be identified. I have been assured that my confidentiality will be respected. I consent to participate in this study.

Name of Participant (please print)	Signature of Participant
Name of Witness (please print)	Signature of Witness
Name of Investigator (please print)	Signature of Investigator
Date	

APPENDIX E

Patient Information Sheet

Training in Self-Generated Imagery as an Adjunct Treatment to Improve Lung Function in Individuals with Asthma

This Patient Information Sheet, a copy of which has been given to you, is only part of the process of informed consent. It should give you a basic idea of what the research project is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. The researcher Keith Zukiwski at 445-1372, or Dr. Barbara Paulson at 492-5298, will answer any additional questions that you have about the research project. Please take the time to read this carefully and to understand any accompanying information.

You have been selected for possible participation in this research study because you have asthma and meet certain requirements about how severe your asthma is and the medications you use.

If you participate in this study, you will be trained in a technique that aims at using the mind to help heal the body. The skills you will be taught have been used by doctors, psychologists, nurses and other health professionals for many years. We would like to see how effective this method is for treating asthma. This training is designed to be a treatment for asthma that is used in addition to your current medical treatment. During the study, you will continue taking your medication as instructed by your doctor. The skills you learn can be applied to asthma or other medical problems well after the study is over.

Your participation in this study is voluntary. You may stop at any time. You may decide to withdraw from the study without affecting your medical care. If you decide to withdraw from the study, you should call the researcher (Keith Zukiwski) as soon as possible to inform him. The researcher and/or your physician may stop your participation in the study at any time if they decide that it is in your best interest. There are also certain reasons relating to changes in your asthma severity or medications that may also require you to stop participation in the study.

If you agree to participate, all information provided by you will be kept confidential. It is possible that your medical record at the Grey Nuns Hospital, as it relates to this study, will be reviewed for quality control purposes under strict confidentiality by the researcher, Dr. MacDonald, and Respiratory Therapists at Respiratory Therapy Services. You will not be identified by name on any reports or publications resulting from

this study. All material and data obtained from this study will be stored and may be used for future analysis without obtaining further consent from you. However, each study arising as a result of information obtained in this study will be submitted for ethics approval.

Everyone who takes part in this study must agree to the following expectations of them:

(1). In order to determine how well this treatment works we have to measure changes in your lung function. You will be involved in the study for three months. This will require you to go to the Grey Nuns Hospitals four times, with approximately 30 days between each visit. Your appointments will be scheduled sometime between 8:15 and 10:00 AM. The respiratory therapists who work with Dr. MacDonald will measure the reversibility of airway obstruction each visit. You will have experienced this procedure before. It involves blowing into a spirometer (a computer which has a tube attached to it) as hard as you can, taking two doses of Ventolin, waiting 10 minutes, and blowing into the spirometer again. This takes approximately 15 minutes. Before coming in for this test you must stop using certain drugs for a certain number of hours. You must not use beta-2 agonists such as Ventolin for 8 hours, short-acting Theophyllines for 12 hours, long-acting Theophyllines for 24 hours, or Atrovent for 12 hours prior to the test. On the first and last visit, an additional 30-45 minutes of your time will be required to do two other tests that involve breathing into a spirometer. On the first visit you will stop at admitting to obtain a Grey Nuns Hospital patient card. The first visit will also serve to find out if you meet all the requirements for the study. It is possible you may be stopped from taking part in the study after the first visit.

(2). You will be provided with an asthma diary on which you will record how often you use your medication, asthma symptoms and severity, how well you slept, and your peak flow rates. If you do not have a Mini-Wright Peak Flow Meter you will be provided with one for the study. Due to the cost of the peak flow meters we request that you return the meter if you withdraw from the study, or when the study is over. It is crucial to have two measurements of peak flow each day, upon waking and at bedtime. Each time you measure your peak flow you will blow into the meter three times. You will record the highest of the three blows in your diary. Please bring your peak flow meter each time you go to the Grey Nuns for a lung function assessment so we can make sure it is working properly and that you are following the procedure correctly. You will be taught how to do this properly.

(3). You will start the 8 weeks of training at the beginning of the second month of the study. By this time you will have filled 30 days of your asthma diary, and you will have just gone for your second visit to the Grey Nuns for a lung function assessment. You will go to the Education Clinic at the University of Alberta once a week for eight weeks. The researcher, Keith Zukiwski, will train you in individual sessions. Each visit will be approximately 50 minutes long. Appointments can be made for the day, evenings, and during the day on weekends. You will be given directions how to get there, and coupons for parking or bus rides. You will be taught skills which you will be expected to practice for a minimum of 20 minutes per day. You will be given a cassette tape that help you to practice. How often you practice will be recorded in the asthma diary. You will be asked to take a peak flow reading at the beginning of each training session, and immediately afterwards.

(4). You will be encouraged to do a small amount of drawing or sketching as part of the training (you can paint if you choose). You are not expected to be good at drawing as the quality is not important. A pad of drawing paper and colored pencils will be provided to you. You will be asked to give your drawings to the researcher at the end of the study.

(5). Follow these instructions:

(a) continue to use medication as directed by your physician;

(b) refrain from beginning an exercise program, or altering a current exercise program for the duration of the study;

(c) avoid severe changes in how much and what you eat, such as deprivation diets;

(d) do not take drugs such as Aspirin which contain acetylsalicylic acid (ASA);

(e) refrain from using cold and allergy medications unless you discuss their use with your physician;

(f) do not exercise within 12 hours before assessment of lung function at the Grey Nuns Hospital;

(g) get a good night's sleep the night prior to assessment of lung function at the Grey Nuns Hospital;

(h) inform the researcher in the event of use of oral corticosteroids, sickness or infection (including colds), changes in prescription or non-prescription medications, sleep disturbances, pregnancy, surgery, severe psychological stressors, and severe weight changes;

(i) record the highest of 3 blows into your peak flow meter, 2 times daily: upon waking and at bedtime;

(j) try to measure your peak flow at approximately the same time each day (± 30 minutes);

(k) on a daily basis record asthma symptoms, medication usage, and home practice of the treatment you have been taught;

(l) practice the treatment at least once each day for 20 minutes;

(m) do not use beta-2 agonists such as Ventolin for 8 hours, short-acting Theophyllines for 12 hours, long-acting Theophyllines for 24 hours, or Atrovent for 12 hours prior to the lung function test;

(n) bring your peak flow meter to each training session;

(o) bring your peak flow meter for each appointment at the Grey Nuns for lung function assessment;

(p) do not tell the respiratory therapists whether you are currently receiving training or waiting until the end of the study for training;

(q) do not discuss the training you receive with other asthma patients as they may be involved in the study.

If you decide not to participate in this study yet want to be trained in techniques that use the mind to help heal the body, the researcher can refer you to a psychologist who will teach you these methods on a fee for service basis.

If you desire help from a mental health professional, either to continue treatment or to deal with any issues that may arise during treatment, you will be given an appropriate referral.