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A comprehensive pulmonary rehabilitation program: Its effect on the psychological and social concomitants of chronic obstructive pulmonary disease

Jacoby, Barry Matthew, Ph.D.

The University of Arizona, 1992
A COMPREHENSIVE PULMONARY REHABILITATION PROGRAM: ITS EFFECT ON THE PSYCHOLOGICAL AND SOCIAL CONCOMITANTS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

by

Barry Matthew Jacoby

A Dissertation Submitted to the Faculty of the DEPARTMENT OF SPECIAL EDUCATION AND REHABILITATION In Partial Fulfillment of the Requirements For the Degree of DOCTOR OF PHILOSOPHY In the Graduate College of THE UNIVERSITY OF ARIZONA

1992
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I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

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Date 5-5-92
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SIGNED: Barry M. Jacoby
DEDICATION

This work is lovingly dedicated to my wife Kathy and our children, Sam and Betsy, whose support, encouragement, and sacrifices enabled me to complete this work. I love you.
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My sincere appreciation and gratitude to the people who have helped bring this research study to a successful conclusion.

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>LIST OF TABLES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>10</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>12</td>
</tr>
<tr>
<td>Background Information</td>
<td>12</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>17</td>
</tr>
<tr>
<td>Research Questions</td>
<td>18</td>
</tr>
<tr>
<td>Limitations</td>
<td>20</td>
</tr>
<tr>
<td>2. REVIEW OF THE LITERATURE</td>
<td>21</td>
</tr>
<tr>
<td>Psychological Adaptation to COPD</td>
<td>23</td>
</tr>
<tr>
<td>Neuropsychological Functioning</td>
<td>24</td>
</tr>
<tr>
<td>Dyspnea (Shortness of Breath)</td>
<td>25</td>
</tr>
<tr>
<td>Anxiety</td>
<td>25</td>
</tr>
<tr>
<td>Depression</td>
<td>26</td>
</tr>
<tr>
<td>Impact of COPD on Psychosocial Functioning and Quality of Life</td>
<td>28</td>
</tr>
<tr>
<td>Effectiveness of Comprehensive Pulmonary Rehabilitation Programs</td>
<td>30</td>
</tr>
<tr>
<td>Reduced Hospitalizations and Cost Savings</td>
<td>31</td>
</tr>
<tr>
<td>Quality of Life</td>
<td>32</td>
</tr>
<tr>
<td>Self-Concept</td>
<td>34</td>
</tr>
<tr>
<td>Survival</td>
<td>34</td>
</tr>
<tr>
<td>Locus of Control</td>
<td>36</td>
</tr>
<tr>
<td>Overview</td>
<td>36</td>
</tr>
<tr>
<td>Health Locus of Control Scale (HLC)</td>
<td>37</td>
</tr>
<tr>
<td>Multidimensional Health Locus of Control Scale (MHLC)</td>
<td>38</td>
</tr>
<tr>
<td>Responses to Chronic Illness and Locus of Control</td>
<td>39</td>
</tr>
<tr>
<td>Health Locus of Control Beliefs as a Dependent Variable in Health Education Interventions</td>
<td>44</td>
</tr>
<tr>
<td>Summary</td>
<td>48</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS--Continued

3. RESEARCH DESIGN AND METHODOLOGY ........................................... 49  
   Research Design ................................................................. 49  
   Research Participants and Data Collection Procedures .................... 49  
   Data Collection Procedures .................................................. 49  
   Clinical Information ............................................................ 50  
   Continuous Supplemental Oxygen Use ......................................... 52  
   Pulmonary Function Tests ..................................................... 53  
   St. Joseph's Pulmonary Rehabilitation Program ................................ 53  
   Veterans Administration Medical Center (VAMC) ................................ 53  
   Instruments .............................................................................. 53  
   Demographic Questionnaire ..................................................... 53  
   Sickness Impact Profile (SIP) ................................................... 54  
   Multidimensional Health Locus of Control Scale (MHLC) ...................... 56  
   Treatment .................................................................................. 58  
   Veterans Administration Medical Center ....................................... 58  
   St. Joseph's Pulmonary Rehabilitation Program ................................ 58  
   Data Analysis ............................................................................. 60

4. ANALYSIS AND INTERPRETATION OF DATA ........................................... 61  
   Subject Data .............................................................................. 61  
   Demographic Data ................................................................. 62  
   Perceived Disease-related Knowledge and Perceived Degree of Impairment ........... 65  
   Clinical Information ................................................................. 67  
   Multidimensional Health Locus of Control (MHLC) ............................. 68  
   Sickness Impact Profile (SIP) ..................................................... 69  
   Summary of Pretreatment Group Differences .................................... 69  
   Treatment Effects and Changes Over Time by Group ................................ 70  
   Perceived Degree of Pulmonary Impairment .................................... 70  
   Multidimensional Health Locus of Control Scale (MHLC) ...................... 75  
   Sickness Impact Profile (SIP) ..................................................... 76
# TABLE OF CONTENTS—Continued

<table>
<thead>
<tr>
<th>Analysis of Post-Treatment Group Differences</th>
<th>78</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multidimensional Health Locus of Control Scale (MHLC)</td>
<td>79</td>
</tr>
<tr>
<td>Internal Health Locus of Control (IHLH)</td>
<td>79</td>
</tr>
<tr>
<td>Chance Health Locus of Control (CHLC)</td>
<td>79</td>
</tr>
<tr>
<td>Powerful Others Health Locus of Control</td>
<td>80</td>
</tr>
<tr>
<td>Sickness Impact Profile (SIP) Psychosocial Scale</td>
<td>80</td>
</tr>
<tr>
<td>Physical Scale</td>
<td>81</td>
</tr>
<tr>
<td>Total SIP</td>
<td>81</td>
</tr>
<tr>
<td>Research Questions and Results</td>
<td>82</td>
</tr>
<tr>
<td>Findings</td>
<td>82</td>
</tr>
</tbody>
</table>

5. **SUMMARY, DISCUSSION, AND RECOMMENDATIONS FOR FUTURE STUDY** | 84 |

| Discussion of Results | 86 |
| Locus of Control | 86 |
| Sickness Impact Profile as a Measure of Treatment Outcome | 88 |
| Comprehensive Pulmonary Rehabilitation Program Participation | 90 |
| Implications of the Study and Recommendations for Future Investigation | 92 |
| Recommendations for Future Research | 93 |
| Recommendations for Program Implementation | 93 |

REFERENCES | 95 |
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Summary of descriptive statistics and group differences for the study sample</td>
<td>71</td>
</tr>
<tr>
<td>2. Summary of pretreatment scores for Multidimensional Health Locus of Control Scale and Sickness Impact Profile</td>
<td>74</td>
</tr>
<tr>
<td>3. Summary of pretreatment mean scores, post-treatment mean scores, and mean change scores by group</td>
<td>77</td>
</tr>
</tbody>
</table>
ABSTRACT

The study, using a quasi-experimental design, examined the relationship between participation in a comprehensive pulmonary rehabilitation program, locus of control, and the psychological and social concomitants of chronic obstructive pulmonary disease.

The study investigated the following questions. To what degree participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component would: (1) generally produce a shift in persons from an external locus of control toward an internal locus of control, (2) specifically decrease the perception of chance, fate, or powerful others to influence and determine personal health; and (3) will result in the lessening of perceived negative effects of the psychological and social concomitants of chronic obstructive pulmonary disease.

Two sample groups were evaluated in the study: (1) a group of 35 moderate to severe chronic obstructive pulmonary disease patients enrolled in a 96-hour comprehensive pulmonary rehabilitation program with a 32-hour psychosocial instructional component, and (2) a group of 35 moderate to severe chronic obstructive pulmonary disease
patients receiving standard medical care at a Veterans Administration Hospital.

Research instruments used for the study were the Multidimensional Health Locus of Control Scale and the Sickness Impact Profile. The research instruments were administered to each study group at approximately 16-week intervals.

Results of the study indicated that participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component did not produce a significant shift in program participants from an external locus of control toward an internal locus of control, nor did it produce a significant decrease in the perception of chance, fate, or powerful others to influence and determine personal health. However, the study results indicated that participation in a comprehensive pulmonary rehabilitation program did produce a significant ($P < .05$) lessening of perceived negative physical and psychosocial effects of chronic obstructive pulmonary disease as measured by the physical scale, psychosocial scale, and total score of the Sickness Impact Profile.
CHAPTER 1

INTRODUCTION

The present study investigated the psychological and physiological status of chronic obstructive pulmonary disease patients and the concept of locus of control. The current investigation also provided an opportunity to measure to what degree participation in a comprehensive pulmonary rehabilitation program would produce a perception of increased control over personal health outcomes and an overall lessened negative effect of the symptoms of chronic obstructive pulmonary disease on physiological and psychosocial functioning.

Background Information

A review of current applicable literature indicated that there has been no specific investigation of the effect of participation in a comprehensive pulmonary rehabilitation program on perceived locus of control. The literature review revealed only minimal investigation of comprehensive pulmonary rehabilitation programs and their effects on lessening the perceived negative consequences of the physiological and psychosocial concomitants of chronic obstructive pulmonary disease. The chronic obstructive pulmonary
diseases (COPD), including emphysema, chronic bronchitis, and adult asthma, are characterized by airway obstruction and reduction in expiratory air flow. COPD, which causes death and disability, has increased in occurrence in recent years. COPD affects 165.3 persons per 1000 in the 65-74 year age group, and 117 persons per 1000 in the 75 year and older age group (United States Department of Health and Human Services, 1985). In the United States in the 1980s, chronic obstructive pulmonary disease ranked as the fifth leading cause of death and accounted for approximately 4% of all deaths (Higgins, 1989). In the age range 55-74 years, COPD ranked as the third leading cause of death in men and the fourth leading cause of death among women in the United States.

Morbidity and disability resulting from COPD is significant. In the United States, COPD was second only to coronary heart disease in the number of patients receiving Social Security disability payments (Feinleib, 1987). The number of COPD patients receiving Social Security disability payment was estimated at 500,000. Data from the National Ambulatory Medical Care Survey (1985) indicated that for the age group 55-84 years, COPD was responsible for 16.4% of physician office visits for men and 12.5% for women (Ries, 1990). COPD was listed as the primary diagnosis in the discharge summary in 923,000 hospitalizations in data from the
National Hospital Discharge Survey (1986). In that study, COPD represented 1.3% of the hospital discharges for men and 0.9% for women in patients age 55-84 years (Ries, 1990). The cost of treatment and lost productivity as a result of COPD was estimated at more than $26 billion in 1982 in the United States (Lenfant, 1982).

Common overall goals of medical treatment for COPD are to relieve symptoms, improve functional status, and enhance quality of life (American Thoracic Society, 1987). Standard medical treatment is important in decreasing the symptoms associated with COPD, especially the distressing symptom of shortness of breath or dyspnea (Hodgkin, Zorn, & Connors, 1984). In large part, the standard medical strategy for treating COPD depends upon oral and inhaled respiratory medications. However, chronic obstructive pulmonary disease is a progressive and irreversible disease process that has disabling psychosocial symptoms as well as physical limitations.

Pulmonary rehabilitation programs for patients with chronic obstructive pulmonary disease are a means of providing a comprehensive approach to treating the physiological as well as the psychosocial problems brought on by COPD. Pulmonary rehabilitation programs are designed to enhance standard medical treatment as well as to optimize the

The goals of pulmonary rehabilitation programs are accomplished by increasing the patient's knowledge of his/her disease and by teaching specific self-management skills to COPD patients. Knowledge and skills acquired through pulmonary rehabilitation programs can result in a lessened dependency upon family, friends, health professionals, and expensive medical resources.

Pulmonary rehabilitation programs have been established in various settings including inpatient, outpatient, hospital, or practice-based (Hodgkin, Zorn, & Connors, 1984). Pulmonary rehabilitation programs are typically provided by a multidisciplinary team of health care professionals (Kirilloff, 1986). Members of such a pulmonary rehabilitation team assess individual patient needs and create a therapeutic strategy to achieve realistic goals and objectives. The goals and objectives of an individual rehabilitation strategy address the psychological and social problems of chronic obstructive pulmonary disease as well as optimize medical therapy.

Evidence indicates that a comprehensive approach to the symptomatic and psychosocial considerations of rehabilitating the chronic obstructive pulmonary disease patient can result in an improved quality of life and in an improved

Psychosocial issues in chronic obstructive pulmonary disease have generated considerable interest among clinicians and researchers. Many authors have attempted to define and delineate the psychological and personal characteristics of COPD patients using standardized psychological tests, clinical interviews, and self-report inventories (Agle, 1977; Dudley, 1980; McSweeny, 1980). General findings of these investigations report significant anxiety, depression, fatigue, difficulty coping, and impaired psychosocial functioning in COPD patients.

The wide-ranging physiological and psychological effects of chronic obstructive pulmonary disease can influence individual patient perception of his/her control over health-related situations. There is considerable research on the relationship between health practices and the individual's expectancies about the source of control of his/her fate (for reviews see Strickland, 1978; Wallston & Wallston, 1978). A theoretical construct applicable to this topic is locus of control.

The concept of locus of control is based on Rotter's (1966) social learning theory. Locus of control is considered by some to be a personality factor that is acquired through a series of social learning experiences (Phares,
1974). Measurement of locus of control provides information about individual orientation relative to the individual's environment (Marsh, 1986). Individuals who believe that what happens to them results from their own actions are characterized as having an internal locus of control (Wallston & Wallston, 1978). Individuals who believe that the power or control over what happens to them is generally outside themselves, either in the form of luck, fate, chance, or resulting from the actions of powerful others, are said to have an external locus of control (Wallston & Wallston, 1978). Studies of various psychotherapeutic self-improvement groups suggest that individuals in therapy change in their perceptions toward more of an internal locus of control as treatment progresses (Diamond & Shapiro, 1973; Dua, 1970; Eitzen, 1974; Schallow, 1975; Lynch, Ogg, & Christensen, 1975).

**Statement of the Problem**

Chronic obstructive pulmonary disease (COPD) is a progressive and irreversible disease process. Persons with COPD must cope with disabling psychosocial symptoms as well as with physical limitations. Yet most COPD treatment regimens focus primarily on medical relief of symptomatology and do not fully address psychosocial issues. Comprehensive pulmonary rehabilitation programs are structured to address psychosocial problems as well as the physiological difficul-
ties brought on by COPD. A primary goal of a comprehensive rehabilitation program is to give the participant an increased perception of individual control (internal locus of control) over his/her personal health care. The present study is designed to provide data about the effectiveness of a comprehensive pulmonary rehabilitation program in increasing internal locus of control and in lessening the impact of symptomatology on the psychological, social, and physiological functioning of chronic obstructive pulmonary disease patients.

Research Questions

The study was concerned with the concept of locus of control and the physiological and psychosocial status of chronic obstructive pulmonary disease patients. Two research questions were posed in this study.

The first question addressed was to what degree participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component would:

1. generally produce a shift in persons from an external locus of control toward an internal locus of control and
2. specifically decrease the perception of chance, fate, or powerful others in influencing and determining personal health.

For purposes of the study, the dependent variable was scores on the subscales of the Multidimensional Health
Locus of Control Scale (Wallston, Wallston, & DeVellis, 1978); the independent variable was two treatment conditions classified as the treatment group and the nontreatment (control) group. The treatment group was 35 patients from the pulmonary rehabilitation program at St. Joseph's Hospital in Tucson, Arizona. The nontreatment (control) group was 35 patients from the Veterans Administration Medical Center in Tucson, Arizona. Further discussion of these two groups will be found in the data sources section of this study.

The second research question was to what degree participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component would result in lessening of perceived negative effects of the physiological and psychosocial concomitants of chronic obstructive pulmonary disease.

For the purposes of the study, the dependent variable for the second research question was scores on the Sickness Impact Profile (Bergner et al., 1981). The Sickness Impact Profile is a behaviorally based measure of sickness-related dysfunction designed to provide a measure of health status. The Sickness Impact Profile investigates 12 areas of specific activity: ambulation, mobility, body care, and movement social interaction, communication, alertness behavior, emotional behavior, sleep and rest,
eating, work, home management, recreation, and pastimes.
The independent variable for the second research question
was a treatment (experimental) group from St. Joseph's
Hospital pulmonary rehabilitation program and a nontreatment
(control) group from the Veterans Administration Medical
Center.

Limitations

The present study focused on chronic obstructive
pulmonary disease patients from the Veterans Administration
Medical Center, Tucson, Arizona, and patients from the
Pulmonary Rehabilitation program at St. Joseph's Hospital,
Tucson, Arizona. The generalizability of this study is
restricted to individuals with these characteristics.

An additional limiting factor of this study is the
difference in the amount of therapeutic attention given to
the experimental group (St. Joseph's Pulmonary Rehabilita-
tion Program) as opposed to the control group (Veterans
Administration Medical Center patients).
CHAPTER 2

REVIEW OF THE LITERATURE

This review of the literature focused on information and research studies relevant to the psychological and social effects of chronic obstructive pulmonary disease, pulmonary rehabilitation, and locus of control theory as applied to chronic disease and treatment outcomes.

Chronic obstructive pulmonary disease (COPD) refers to a group of illnesses in which lung tissue has been permanently altered or destroyed in such a way that air flow is obstructed in to and out of the lung (Comroe, 1964). The obstruction is the result of increased mucus production, increased viscosity of secretions, narrowing of bronchial airways, impaired gas exchange of oxygen and carbon dioxide, and loss of elasticity in the lungs. Tissue damage usually results from repeated insults by a toxic agent such as cigarette smoke or environmental causes; however, the exact mechanisms of the histological changes are unknown. Chronic bronchitis, emphysema, and adult asthma are the major diseases in the group. The three disease components of COPD have conditions that commonly coexist, presenting similar signs and symptoms.
When substantial alteration of normal lung occurs, the patient experiences shortness of breath and decreased exercise tolerance (Tisi, 1980; West, 1977). Physical limitation is the result of both altered gas exchange and mechanical properties and is often relentless and progressive even if the initiating insult is removed.

Individuals with chronic obstructive pulmonary disease experience a frequent, productive cough, dyspnea, and recurring acute infections of the lower respiratory tract (Tisi, 1980; West, 1977). Medical intervention cannot reverse the course of the disease process per se but is limited to lessening symptoms through medication and rehabilitation.

COPD is a chronic condition; it gradually worsens, with symptoms becoming increasingly severe and exacerbations occurring frequently. The disease tends to be insidious because by the time the air flow obstruction becomes advanced enough to cause symptoms of breathlessness that are severe enough to present his/her complaints to a physician, the patient's ventilatory capacity is often severely compromised (Fletcher et al., 1977).

Degree of air flow obstruction is usually diagnosed by a forced expiratory volume in one second (FEV₁₀₀), with predicted values for age, sex, and height (Guyatt et al., 1987).
In general, patients become unable to perform vigorous exertion once the FEV\textsubscript{1.0} falls below 1.5 liters but are often able to continue work unless their jobs are physically demanding (Burrows, 1985). However, Burrows states that "there is considerable variability in the relationship of impairment to disability some of which relates to psychological factors" (p. 27).

Longevity in the COPD patient can be estimated in relation to the FEV\textsubscript{1.0} (Burrows, 1985). Median survival is approximately 10 years when the FEV\textsubscript{1.0} is 1.4 liters; approaches 4 years when the FEV\textsubscript{1.0} has fallen to 1.0 liters; and is approximately 2 years when the FEV\textsubscript{1.0} nears 500 milliliters (Burrows, 1985).

Psychological Adaption to COPD

COPD produces considerable stress on both the patient and his or her family. Dudley, Glaser, Jorgenson, and Logan (1980) state that COPD is a disease that interferes with breathing, reduces energy and vitality, produces symptoms that progressively worsen and fluctuate, and tends to produce psychosocial difficulties. COPD patients experience reduction in their ability to perform social, sexual, recreational, and vocational activities of daily living. As a consequence of all these factors, anxiety, dependency, and loss of self-esteem typically result. In 1977, Rutter studied 83 patients with chronic
bronchitis and observed that the prevalence of psychiatric illness in COPD may be as high as 50%. Rosser, Denford, Hesop, and Kingston (1983) studied COPD patients using the General Health Questionnaire. Rosser et al. reported that 60% of their respondents were psychologically impaired.

COPD patients often choose a lifestyle that is physically and socially constricted (Lester, 1973). COPD patients often socially withdraw and avoid interaction with others. Lustig, Haas, and Castillo (1972) researched 45 chronic obstructive lung disease patients, noting a tendency for these patients to become withdrawn and avoid social interaction. Dudley, Wermerth, and Hague (1973) observed that many severely disabled COPD patients tend to live in "emotional strait-jackets," with patients no longer able to become angry, depressed, or even happy due to the likelihood of any significant emotional changes triggering dyspnea (Dudley et al., 1973).

**Neuropsychological Functioning**

Some studies have suggested that COPD patients experience neuropsychological impairments because COPD deprives the brain of oxygen (Prigatano, Wright, and Levin, 1984). Two major clinical trials indicated that severity of COPD is associated with degree of neuropsychological impairment. Deficits appeared to be more severe for perceptual and rate-processing tasks and least disrupted for motor and
Dyspnea (Shortness of Breath)

The major symptom experienced by COPD patients is dyspnea or shortness of breath. Dyspnea involves increased work in breathing due either to decreased breathing capacity or increased ventilatory requirements (Committee on Rating of Mental and Physical Impairment, 1965). The most common form of decreased breathing capacity experienced by COPD patients is obstructive in nature due to increased resistance to the flow of air. Dyspnea is extremely subjective in nature and is only partially related to the degree of functional impairment (Haas et al., 1979). In a study of bronchitic patients, Oswald, Waller, and Drinkwater (1970) found that measures of anxiety and neuroticism showed a better relationship to complaints of dyspnea than did diagnostic categories based on sputum production, wheezing, and cough.

Anxiety

Anxiety is also a major factor in the course and treatment of COPD. Dudley, Glaser, Jorgenson, and Logan (1980) speculated that anxiety increases the perception of dyspnea and can result in phobic avoidance of activity, with the COPD patient becoming increasingly inactive because of spatial functions (Heaton et al., 1983; Intermittent Positive Pressure Breathing Group, 1983).
fear of his/her symptoms. The patient's difficulty may be exacerbated by a "respiratory panic" that will cause him or her to struggle more and breathe less efficiently (Neff & Petty, 1971). In identifying factors that contribute to gains in functional capacity during pulmonary rehabilitation, Agle, Baum, Chester, and Wenat (1973) hypothesized that decreasing patients' unrealistic anxiety about dyspnea and about activity was a critical factor (Agle, Baum, Chester, & Wenat, 1973). However, the observations made by these authors were not tested empirically and were based only on clinical judgement.

**Depression**

Another frequent psychological state among COPD patients is depression. McSweeny et al. (1982) assessed 150 COPD patients with the Minnesota Multiphasic Personality Inventory (MMPI) and found that 42% exhibited evidence of significant depression compared to 9% among matched controls. Lester (1973) found that COPD patients scored significantly higher (P < 0.05) above standard levels on the depression, hysteria, and hypochondriasis scale of the MMPI than did non-COPD patients. Studies by Dudley et al. (1980), Agle and Baum (1974), and Light et al. (1985) indicate that COPD patients exhibit depressive symptoms. In a study of 43 men with COPD, DeCencio, Leshner, and Leshner (1968) found elevations in 9 out of 10 Minnesota Multiphasic
Personality Inventory (MMPI) clinical scales, including depression. However, these findings of elevated depression were generally not considered exceptional as other groups of chronically ill patients in the same study scored higher than patients with COPD on various MMPI scales (DeCencio, Leshner, & Leshner, 1968). Dudley et al. (1980) noted that their own research did not confirm significant elevations in the MMPI distinctive for COPD. They suggest that variations in results among studies may be due to population, age, degree of disability, and physical symptoms as well as to economic and social status.

Age and social class have an effect on the manifestation of psychopathology in the COPD patient. In a study of 100 COPD patients using a COPD specific questionnaire, Guyatt et al. (1987) found that older patients tended to report fewer emotional problems than their younger counterparts. Casselith, Lusk, and Strouse (1984), in a study of six diagnostic groups of chronically ill patients including COPD, also found lower levels of depression and anxiety in older patients. Sampling a predominantly lower economic class of COPD patients, Lester (1973) found significantly elevated levels on the hypochondriasis and hysteria scales of the MMPI. Logan and Johnson (1974), also using a lower socioeconomic class of COPD patients, reported significant elevations on the "psychopathic deviance" and "psychasthe-
nia" scales. Dudley et al. (1980) did not detect elevations on these scales in their predominantly upper middle class group of COPD patients. Dudley et al. (1980, p. 415) noted that these results may suggest a "positive relationship between social class and adjustment to disease process."

**Impact of COPD on Psychosocial Functioning and Quality of Life**

Several studies have investigated the possible relationship between quality of life diminishment and measures of pulmonary function. Guyatt et al. (1987), Kinsman et al. (1983), and Salata and Berman (1981) found the correlation between various measures of pulmonary function and quality of life to be relatively weak.

McSweeny et al. (1982) attempted to systematically assess quality of life and psychosocial functioning using the Sickness Impact Profile (SIP), a quality of life instrument designed for the general population. The investigators found COPD patients to be more severely impaired on all dimensions when compared to age-matched controls. Scales particularly affected included household management, physical mobility, sleep and rest, social interactions, and recreations and pastimes.

Kinsman et al. (1983) constructed a checklist of 89 symptoms that COPD patients commonly experience and used it on a sample of 146 consecutive patients admitted for hospi-
talization. Respondents cited frequent dyspnea and fatigue as major difficulties as well as sleep difficulties (1983). A similar approach was used by Guyatt et al. (1987) using a 108-item questionnaire designed to determine the frequency and importance of significant areas of dysfunction in COPD. Study subjects were 100 men and women COPD outpatients. Guyatt et al. also found that problems with dyspnea, fatigue, and sleep occurred frequently. However, items concerning embarrassment, anxiety, and depression were more frequently reported and rated with a higher degree of importance than they were by Kinsman et al.'s subjects.

Prigatano, Wright, and Levin (1984) evaluated quality of life characteristics in 985 mildly hypoxemic COPD patients and found significant impairment in life quality activities, including dysphoric mood and limited psychosocial functioning, despite minimal physical limitations.

Baum and Agle (1977) reported that at least 17 of the 23 patients in a 4-week pulmonary rehabilitation group exhibited significant symptoms of anxiety, depression, body preoccupation, and sexual dysfunction. The evaluation resulted from psychiatric interviews and twice-weekly, group therapy sessions during rehabilitation. Results, however, were anecdotal in nature.

In a study of 128 COPD patients, Hanson (1982) reported that the effects of lung disease severely impaired
ll categories including: life in general, employment and income, care of children, dependency on others, emotions, sexual and emotional aspects of marriage and self-care, effects of treatment, and effects of symptoms.

Effectiveness of Comprehensive Pulmonary Rehabilitation Programs

The typical multidisciplinary, comprehensive pulmonary rehabilitation program includes a variety of treatment modalities that may be individualized according to the needs of each patient and to the resources and expertise available in a particular program (Ries, 1990). The American Association for Respiratory Care (AARC) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) conducted a survey to characterize and quantitate existing pulmonary rehabilitation programs (Bickford, 1987). Survey results found that the health care professional most typically participating in comprehensive pulmonary rehabilitation programs were physicians, nurses, respiratory therapists, social workers, and dietitians.

In evaluating the benefits of comprehensive pulmonary rehabilitation, determining which of the integrated program components are most responsible for specific outcomes is often difficult (Ries, 1990). For example, a specific treatment (e.g., exercise, education, counseling) provided by well-trained, empathetic personnel will also
provide psychosocial support. Another consideration in evaluating pulmonary rehabilitation literature is that many studies have included small numbers of patients. Most important, perhaps, is that certain benefits, although dramatic individually, may not occur in all subjects; therefore, statistical analyses of group means may miss real benefits for some patients (Miller, 1954).

**Reduced Hospitalizations and Cost Savings**

Comprehensive pulmonary rehabilitation programs have been shown to be a cost-effective means of producing significant benefits for COPD patients. Several studies have examined hospitalization and cost-savings within the first year after pulmonary rehabilitation. Agle et al. (1973), Johnson (1980), Lertzman and Cherniack (1976), and Petty et al. (1969) all reported significant decrease in hospitalization days with patients evaluated 1 year after entry to a pulmonary rehabilitation program compared with the year before.

Several investigators have examined the long-term cost-effectiveness of pulmonary rehabilitation. Wright et al. (1983) investigated a group of 74 patients who had completed an outpatient multidisciplinary pulmonary rehabilitation program at least 1 year prior to the study. The researchers found that the number of days of hospitalization
for the group decreased from 497 days in the year before participating to 34 days in the year after program completion. Hodgkin, Zorn, and Connors (1984), Hudson (1976), Johnson (1980), and Sneider, O'Malley, and Kahn (1988) found that there were significant reductions in hospitalizations from 3 to 8 years in patients completing comprehensive pulmonary rehabilitation programs. Reduced hospitalizations result in savings to individual patients and to third-party payors.

**Quality of Life**

For COPD patients, the major benefits of pulmonary rehabilitation are related to improved quality of life, reduction in crippling respiratory symptoms, increase level of physical activity, increased independence in performing activities of daily living, and improvement in psychological functioning (Petty et al., 1969; Wright et al., 1983).

Bebout, Hodgkin, Zorn, Yee, and Sammer (1983) administered a quality of life questionnaire to 75 COPD patients an average of 92 months (minimum of 24 months) after a comprehensive pulmonary rehabilitation program. Among the 43 patients who responded at followup, more than 50% reported improvement in dyspneic symptoms, ability to go outside, frequency of difficult breathing episodes, and self-assurance.
In a study of multidisciplinary pulmonary rehabilitation in 31 patients, Guyatt, Berman, and Townsend (1987) included measures of quality of life using a chronic respiratory disease questionnaire. Twenty-four patients demonstrated improvement in quality of life measured two weeks after completing the program. Over 6 months of follow-up, the improved quality of life was sustained by 11 of these 24 patients.

Moser et al. (1980) studied 29 participants completing a comprehensive pulmonary rehabilitation program for inpatients. Moser et al. found that 16 of 29 patients improved in terms of frequency and severity dyspneic symptoms. An additional 11 of these 29 patients improved with regard to performance of activities of daily living. In a report of the results of an outpatient pulmonary rehabilitation program, Mall and Medieros (1988) found that 77% of the 197 patients studied showed improvement in dyspneic symptoms.

Atkins et al. (1984) administered extensive psychosocial outcome parameters to 60 COPD patients which included a quality of well-being scale. After 3 months of exercise and behavioral intervention (without formal pulmonary rehabilitation), the experimental group (N = 30) demonstrated significantly greater positive changes in the
quality of well-being measurement compared to the no-treatment control group (N = 30).

**Self-Concept**

Kersten (1990) administered a 20-item self-concept scale to 37 COPD patients who were participating in a 5-week inpatient multidisciplinary pulmonary rehabilitation program. Patients were asked to evaluate their past, present, and future selves on program admission, on program discharge, and 2 to 6 months after home discharge. Mean total self-concept score for the present self significantly increased between program admission and home discharge 3 weeks later. No significant declines in self-concept were found 2 to 6 months after home discharge.

**Survival**

Survival for COPD patients is reduced considerably (Traver, 1979). The poor rate of survival is related to the fact that the diseases are typically recognized and diagnosed at an advanced stage. Studies examining the survival of COPD patients after pulmonary rehabilitation suggest that comprehensive pulmonary rehabilitation programs can improve survival (Hodgkin, 1990).

Bebout et al. (1983) reported improved survival after a comprehensive pulmonary rehabilitation program for 75 COPD patients in a retrospective study comparing those
patients with other published studies. However, patients in this study have less severe disease than in the comparison studies.

Sneider, O'Malley, and Kahn (1988) compared survival in patients with COPD who completed the pulmonary rehabilitation program with other patients seen in the same institution. They found higher survival for the rehabilitating patients each year over 10 years of followup. Survival rates were similar to those reported by Bebout et al. (1983) even though these patients were more severely impaired.

Comparing 252 rehabilitated COPD patients with 50 control subjects from an outpatient clinic, Haas and Cardon (1969) reported 5-year mortality rates from respiratory failure of 22% in the rehabilitated patients and 42% in control subjects.

In a study of 182 patients who had participated in a comprehensive pulmonary rehabilitation program, Sahn, Nett, and Petty (1980) reported 41% survival at 5 years and 17% at 10 years. However, the program was conducted in Denver, Colorado, at altitude, a factor that would reduce survival for COPD patients. Comparing these results to data on the natural history of COPD patients at a comparable altitude, the role of survival was found to be significantly improved.
Locus of Control

Overview

The internal-external control reinforcement (I-E) dimension is an expectancy variable couched within Rotter's social learning theory (Rotter, 1954; Phares, 1976). I-E refers to the degree to which an individual perceives the events that happen to him/her as dependent on his/her own behavior or as a result of luck, chance, fate, or powers beyond one's own personal control and understanding.

Assessment of I-E expectancies is done through questionnaires (Strickland, 1978). The first Locus of Control Scale evolved out of two dissertations presented at Ohio State University (Lefcourt, 1981). Phares (1955) developed a brief Locus of Control Scale that James (1957) expanded and relined into a 60-item Likert Scale questionnaire. The James-Phares Locus of Control Scale provided the source from which Rotter's I-E Scale was subsequently developed.

Rotter's Internal-External Locus of Control Scale (1966) is a 23-item general forced choice questionnaire that assesses I-E expectancies. Individuals are classified as having an internal or external locus of control orientation. Rotter's I-E Scale has been widely used as a research instrument with a variety of adult populations (Strickland, 1975).
Not long after Rotter's I-E Scale was first published, a second Locus of Control Scale was introduced (Lefcourt, 1981). The Intellectual Achievement Responsibility (IAR) questionnaire (Crandall, Katovsky, & Crandall, 1965), which targeted children's achievement behavior, differed from Rotter's I-E Scale in three significant ways: (1) goal specificity, (2) type of outcomes or experiences to be explained (success or failure), and (3) specific agents that exert an external influence on reinforcements.

Reid and Ware (1974) expanded on the work of Mirels (1970) and MacDonald (1971), which explored external orientation factors of personal control and social system control. Reid and Ware devised three subscales concerned with beliefs about self-control, personal control, and social system control.

Almost concurrent with the Reid and Ware studies, Levinson (1973) presented her own three-subscale version of Rotter's I-E Scale. Levinson's subscales (internal, chance, and powerful others) brought into focus various agents of control that could affect outcomes (Lefcourt, 1981).

**Health Locus of Control Scale (HLC)**

Recognizing the need for a specialized measure of locus of control to assess health-specific control expectancies, Wallston et al. (1976) developed a health-related Locus of Control Scale. Wallston et al. claimed that their
unidimensional Health Locus of Control (HLC) scale would improve prediction of health-related behaviors in contrast to the more generalized measure, such as Rotter's (1966) Internal-External Locus of Control Scale (Coelho, 1985).

The original health-related Locus of Control Scale (the HLC Scale) (Wallston et al., 1976) consisted of 11 items in a 6-point Likert format (Lefcourt, 1981). Congruent with most other measures of locus of control, the HLC Scale was scored so that high scores indicated agreement with externally worded beliefs. Individuals with scores above the median were labeled "health externals"; health externals were presumed to have expectancies that they have little control over the factors that determine their health. At the other end of the scale, individuals scoring below the median were "health internals," who believe that one stays healthy or becomes sick as a result of his or her own behavior.

**Multidimensional Health Locus of Control Scale (MHLC)**

In 1978, Wallston, Wallston, and DeVellis revised the HLC (Sanders & Sells, 1984). Modeled after Levinson's I (Internal), P (Powerful Others), and C (Chance) Scales, the Multidimensional Health Locus of Control Scale consists of three 6-item scales, again using a 6-point Likert format. The major contribution of Levinson's multidimensional
approach was in splitting externality into two distinct components that relate to health-related behaviors. The PHLC Scale assesses beliefs that one's health is determined by powerful other people (e.g., doctors, nurses, family, or friends). The CHLC scale measures the extent that health illness is a matter of fate, luck, or chance. The two external scales PHLC and CHLC are treated as separate measures of health locus of control beliefs. The IHLC Scale measures health internality, or the extent to which internal factors are responsible for their health illness.

Two different forms (A and B) of the MHLC are available; each contains three 6-item scales (Coelho, 1985). In addition, a third version that consists of 12-item scales can be obtained by combining forms A and B.

Responses to Chronic Illness and Locus of Control

Social learning theory explains an individual's expectancies for control in terms of history (Nagy & Tong, 1983). An individual's past experiences are recognized as playing a primary role in shaping attitudes and beliefs that directly affect outcomes. In the social learning model, beliefs regarding locus of control are not necessarily considered traits of fixed attributes, but instead are modifiable personal constructs. Thus, natural, accidental,
and deliberately contrived situations can potentially change an individual's orientation in terms of locus of control.

Long-term illness is one type of experience that could potentially influence health locus of control beliefs (Nagy & Wolfe, 1983). One effect of long-term illness could be to reduce internal HLC beliefs. Nagy and Wolfe suggest that coping with chronic illness might provide continuing evidence that an individual patient has limited control over his/her health. Studies by Raps et al. (1982) and Taylor (1979) suggest that hospitalization results in the forfeiture of control and eventually produces behavior described as learned helpfulness. Treatment for chronic illness involves repeated interaction with the health care delivery system; exposing the individual patient to situations that he/she cannot completely control.

Strickland (1978) noted that any impending or disabling disorder, whether chronic or temporary, has a varying degree of influence on the responses of the persons faced with the handicap. The severity of the disorder, time of the onset, current status of the patient, support that he/she receives, and so on, all interact with what is probably a complex set of cognitions about the disorder. When an individual is more helpless than he/she once was, or is handicapped in relation to others, beliefs about locus of
Additional factors influencing locus of control attributions include age (e.g., Nagy & Wolfe, 1983); education (Pill & Stott, 1982, 1985); socioeconomic status (Elder, 1973); personality (e.g., Rhodewalt 1984; Rhodewalt & Davidson, 1983; Strube 1985); and the nature of the illness (Mumma & McCorkle, 1982-83).

In a study that questioned how an individual might respond to various physical handicaps in terms of social relations and self-image, McDonald and Hall (1971) found that healthy college students with an external locus of control attribution rated physical disabilities as more debilitating than did student respondents with an internal locus of control attribution.

Eggland (1973) and Goldstein (1976) conducted research with chronically ill and handicapped children. Both studies concluded that the chronically ill and handicapped subjects tended to be more external in locus of control beliefs than their healthy counterparts. However, a study by Jones (1974) of orthopedically disabled children found no relationship between internal/external locus of control beliefs and degree of mobility.

Wendland (1973) tested 80 males age 18-35 with muscular skeletal impairments. Results indicated that
subjects who had been disabled less than 1-1/2 years were significantly more external than subjects disabled 3 years or longer. Wendland suggested that disabled individuals have a tendency to expect increased direction from external forces during the initial period following a disability onset.

Bruhn, Hampton, and Chandler (1971) compared a group of 36 male hemophiliacs age 12 and over with a control group of healthy normals. The investigators found that overall the hemophiliac group was more internal than the healthy controls. However, within the hemophiliac group, a marginally severe group was significantly more external than either a mild or severe group. The researchers suggested that the marginally severe group viewed its clinical state as unpredictable and was thus more dependent on external cues to determine its well-being. Goldstein (1976) compared 24 long-term hemodialysis patients with 22 male patients, all of whom were recovering from minor medical problems. The hemodialysis group obtained higher externality scores than the nonhemodialysis control subjects.

Using the Health Locus of Control Scale (HLC), Brown (1980) studied 100 patients using permanent pacemakers and found the group to be more external in health locus of control beliefs than the healthy adult normative population used for HLC. Brown (1979) with COPD patients, Wallston and
McLeod (1979) with male hypertensives, Diller et al. (1979) with cancer patients, Key (1975) with female hypertensive patients, and Sproles (1977) with chronic hemodialysis patients using the HLC scale obtained similar results compared to the healthy adult normative population.

Nagy and Wolfe (1983), using the Multidimensional Health Locus of Control Scale with 250 male chronically ill ambulatory patients averaging 60 years of age, found that perceived negative effects of illness were related to low internal health locus of control scores. The researchers also found that the older diabetic, hypertensive, respiratory, and general medicine patients involved in the study showed no significant differences in internal, chance, or powerful others HLC scores between groups. However, the sample of chronically ill patients scored higher on the chance HLC scale and powerful others HLC scale compared to HLC scores attained by healthy adults in a study by Wallston and Wallston (1981). Buckelew et al. (1990), also using the Multidimensional Health Locus of Control Scale with 67 men in a comprehensive pain rehabilitation program, found that younger men reported a stronger internal attributional style than older men; older men relied more on a chance and powerful others HLC attributional style.
Health Locus of Control Beliefs
as a Dependent Variable in Health
Education Interventions

Health Locus of Control expectancies can contribute to understanding responses to health care interventions (Wallston & Wallston, 1982). Many health care interventions, particularly health education programs, generally emphasize patient responsibility and internal beliefs (Wallston & Wallston, 1981). Thus, an indicator of the success of health education programs would be changes in expectancies regarding health locus of control, utilizing locus of control beliefs as a dependent measure.

Roter (1977) designed a health education intervention to increase question-asking during medical visits. The target for the education program were 294 predominantly black, elderly, female patients with a variety of chronic illnesses. Results showed that the health education program increased internal scores of health locus of control beliefs for treatment group patients compared to placebo control group patients. Bloom (1979) compared the HLC scores of two groups of mastectomy patients within one week post surgery and two months post-surgery. One group (N = 18) received a special counseling intervention while the comparison group (N = 18) received only standard care. Bloom found that there were no significant between group differences on the first administration of the locus of control measure (4-7
days post-surgery); however, the intervention group was significantly less external in HLC beliefs than the comparison group 2 months post-surgery.

Howland et al. (1986) studied the effects of health education programs for chronic obstructive pulmonary disease patients (N = 213). The programs consisted of two levels: a 12-hour program for severely impaired patients and a six-hour program for moderately impaired patients. The investigators used a quasi-experimental (pre/post test) design and the Multidimensional Health Locus of Control Scale (MHLC) as a dependent measure. Howland et al. (1986) found that there was a significant shift toward "internality" in the intervention group compared with nonintervention controls (N = 325).

Charmak (1989) studied the effects of a comprehensive psychosocial rehabilitation program for cancer patients. The results of Charmak's study found that program participants had an increased sense of personal control over their life situation after completing the program compared to before participation.

Using the MHLC, Hindi-Alexander and Cropp (1984) evaluated the results of a 12-hour patient education program for children (N = 29) with asthma and their parents (N = 42). The MLOC was administered before and after program participation. Results indicated a significant shift toward
internality for both parent and child groups after completing the program.

Several studies of health education intervention programs have failed to find changes in locus of control beliefs consistent with program intent (Wallston & Wallston, 1982).

Nagelberg (1979) administered the MHLC to 252 first-year college students before and after completing a health risk reduction program. Results showed no significant locus of control changes in the treatment group after completing the program as well as no significant changes in the treatment group compared to the no-treatment control group. Nagelberg noted that her sample showed relatively high internal beliefs, which may have produced a ceiling effect for that variable.

Schiller et al. (1979) used the MHLC as one of several dependent variables to evaluate a health education program for residents of rural West Virginia. A principle objective of the program was to change participant attitudes about their ability to care for themselves. The investigators expected increases in internal health locus of control beliefs (IHLC) and decreases in powerful others locus of control beliefs (PHLC) and chance locus of control beliefs (CHLC). However, no significant locus of control changes were reported.
Frankel (1985) studied the impact of a psychological intervention program designed to enhance the psychological and social adjustment to cancer. The MHLC was used as a dependent measure. The treatment program was a 6-hour workshop consisting of medical information, emotional support, and psychological coping techniques. The study results showed no significant differences in health locus of beliefs between workshop participants (N = 12), experimental group, and a no-treatment control group (N = 12) 4 weeks after workshop completion.

Neish (1988) evaluated a patient education program tailored to enhance internal locus of control (IHLC) and disease-related knowledge in chronic obstructive pulmonary patients. Using the MHLC and a pre-test post design, Neish found that changes in IHLC were not significantly greater in the experimental (treatment) group than in the control (no-treatment) group that received only standard medical care.

McCoy (1987) used the Multidimensional Health Locus of Control Scale to assess the effects of a physical fitness training program on health locus of control beliefs. The study sample was 22 healthy adults. McCoy found that physical fitness training did not significantly change internal locus of control beliefs.
Summary

The literature review has examined previous studies relevant to the subject areas of the investigation. As evidenced by this review, many studies have been conducted to investigate the psychological and social concomitants of chronic obstructive pulmonary disease, the benefits of comprehensive pulmonary rehabilitation programs, and health locus of control. Although no studies investigating the relationship between locus of control and comprehensive pulmonary rehabilitation programs could be found, several relevant and similar studies were discussed in the Health Locus of Control as a Dependent Variable in the Health Education Interventions section of this literature review. The fact that no studies investigating the combination of pulmonary rehabilitation programs and health locus of control were found although health locus of control has been used as a variable to investigate health care interventions with other chronic diseases, appears to add support to the need for this study.
CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

This chapter describes the research design, research participants, measuring instruments, data collection procedures, and methods of data analysis used for the present study.

Research Design

A quasi-experimental pre-test-posttest control group design was used for the present study (Campbell & Stanley, 1963).

Research Participants and Data Collection Procedures

Two sample groups are included in the present study. The first was comprised of 35 patients diagnosed as having moderate to severe chronic obstructive pulmonary disease who were enrolled in the St. Joseph's Hospital Pulmonary Rehabilitation Program in Tucson, Arizona. The St. Joseph's Hospital Pulmonary Rehabilitation Program is a 96-hour program consisting of 2-hour sessions three times per week for 16 weeks. The program is comprehensive in structure, comprised of educational, exercise, and psychological treatment components. The 35 patients in St. Joseph' Pulmo-
nary Rehabilitation served as the treatment (experimental) group for the study. The second group was comprised of 35 patients diagnosed with moderate to severe chronic obstructive pulmonary disease, receiving treatment at the Veteran's Administration Medical Center (VAMC) in Tucson, Arizona. The VAMC group received standard medical treatment only and served as the nontreatment (control) group for the present study. The VAMC group received its treatment at the outpatient pulmonary clinic at the Veteran's Administration Medical Center. Participation in the present study was voluntary for both groups. Both groups were told that the present study may not be of direct benefit to them but might help patients in the future. Study participants were told that they could refuse to participate in the study or withdraw at any time. Both groups were informed that any information derived from their responses would be used only for research purposes; study subjects would not be identified personally. No attempt at group matching was made. Consent forms were obtained from all participants.

Data Collection Procedures

Data used for the study consisted of scores on the Multidimensional Health Locus of Control Scale (MHLC) (Form A) (Wallston, Wallston, & DeVellis, 1978), scores on the Sickness Impact Profile (Gilson et al., 1981), and clinical information pertinent to physiological impairment (supple-
mental oxygen use and pulmonary function test results). Demographic data were collected, including age, education, marital status, household income, and pet ownership. Questions pertaining to individual perception of impairment and disease-related knowledge were also included in this section.

Data were collected from the two sample groups in the following manner. The demographic questions, Multidimensional Health Locus of Control Scale, and Sickness Impact Profile were administered to the treatment group at St. Joseph's Hospital Pulmonary Rehabilitation Program at the first program session. The study instruments were administered to 5 consecutive groups who began the program on April 5, April 29, June 3, July 2, August 6, and September 9, 1991. Followup data collection for the treatment groups was conducted on July 9, August 16, September 23, October 16, November 12, and December 16, 1991. The Multidimensional Health Locus of Control Scale, Sickness Impact Profile, and the impairment perception and disease section of the demographic information inquiry was administered on the last session of the program for each of the 5 treatment groups. Clinical data were collected from the medical records between the first and second administration of the assessment instruments.
Data collection for the nontreatment group at the VAMC was conducted on June 14, June 19, June 26, June 28, July 3, July 15, and July 17, 1991. VAMC control group subjects were given the Multidimensional Health Locus of Control Scale (MHLC), the Sickness Impact Profile and Demographic Inquiry as they waited for their outpatient clinic appointments. Followup data collection was conducted 16 weeks later by mail, with completed data returned to the VAMC pulmonary medicine section.

**Clinical Information**

Continuous supplemental oxygen use and the results of pulmonary function tests were used to measure the degree of pulmonary impairment in study participants.

**Continuous Supplemental Oxygen Use**

Supplemental oxygen is a physician-prescribed treatment modality used to counterbalance the effects of hypoxemia (low blood oxygen) in the COPD patient. Use of supplemental oxygen is considered to be an indication of significant pulmonary impairment. For the purposes of this study, continuous 24-hour usage of prescribed supplemental oxygen was considered an indication of severe pulmonary impairment.
**Pulmonary Function Tests**

The FEV\textsubscript{1.0} is the forced expiratory volume in the first second of expiration after a maximum inspiration. FEV\textsubscript{1.0} is measured in liters per second (Burrows, 1985). The FEV\textsubscript{1.0} is accepted as a clinical measure of functional impairment and was used for that purpose in this study.

**St. Joseph's Pulmonary Rehabilitation Program**

FEV\textsubscript{1.0} measures for each treatment group patient were taken prior to or at the initial session of the program.

**Veterans Administration Medical Center (VAMC)**

FEV\textsubscript{1.0} measures taken at the time of initial data collection were used as clinical data for the present study.

**Instruments**

**Demographic Questionnaire**

The Demographic Questionnaire asked for information regarding age, educational level, marital status, and household income. Questions were also asked about perceived degree of impairment and perceived degree of disease-related knowledge.
The Sickness Impact Profile (SIP) was developed by Bergner et al. (1981) to provide a quantitative measure of functional ability. The SIP measures the behavioral impact of sickness in terms of performance of daily activities. It is a self-administered questionnaire of perceived health status designed to be applicable across varying types and severities of illness and across demographic and cultural subgroups. The initial work to develop the SIP began in 1972 with the collection and evaluation of statements that describe sickness-related behavioral dysfunction. The statements were collected from patients, health care professionals, individuals caring for patients, and the apparently healthy. The statements were then subjected to standard grouping and sorting techniques, which initially yielded 312 unique items describing a sickness-related behavioral change. Items were then grouped into areas of activity or categories. Five judges linked the items together; the minimum criterion for retaining a pair of items in the same category was agreement by at least three out of the five judges. In a series of field trials, subject to reliability testing and validation, the number of items in the final form was reduced to 136, which fell within 12 categories. In its final form, each item was weighed on a 15-point scale of dysfunction that ranged from
minimally dysfunctional to maximally dysfunctional. The test instructions asked the respondent to check only the items that describe him/her today and that were related to the state of his/her health.

In addition to the 12 SIP categories, there are also two dimension scores that may be calculated from groupings of individual categories (Gilson et al., 1981). A physical dimension score may be calculated from the mobility, ambulation, body care, and movement categories. A psychosocial dimension score may be calculated from the social interaction, communication, alertness behavior, and emotional behavior categories. In addition, there are five other categories: sleep and rest, eating, work, home management, and recreation and pastimes. An overall SIP percent score may be calculated by summing the scale value of all items endorsed in the entire SIP, dividing that sum by the sum of the values of all the items in the SIP, and multiplying the obtained quotient by 100. Scores for each category and dimension are calculated in a similar manner. The higher the individual's score on the SIP, the higher is his/her perceived level of functional disability.

Test-retest reliability in terms of total score of the SIP is high ($c = 0.75$ to $0.92$) (Gilson et al., 1981). Reliability in terms of items checked is moderate ($c = 0.45$ to $0.60$). Coefficient alpha estimates of inter-item
consistency is high ($c = 0.94$). The correlation between SIP score and self-assessment of sickness is $c = 0.63$. Construct validity has been deemed as appropriate for an instrument that is trying to measure a characteristic for which there is no criterion.

**Multidimensional Health Locus of Control Scale (MHLC)**

The Multidimensional Health Locus of Control Scale is a locus of control measure that focuses on health-related behavior. Using a 6-point Likert-type format, the MHLC is an 18-item instrument that reflects the belief that the source of reinforcement for health-related behaviors is primarily one of three modes: (1) Internal, (2) Powerful Others, and (3) Chance. Responses range from "strongly disagree" with a point value of one to "strongly agree" with a point value of six. The (18-item) parallel A and B forms of the MHLC yield three scale scores: Internal (I), Powerful Others (P), and Chance (C). Form A was selected for use in the present study.

The MHLC was originally validated on a sample of 115 persons (57 male, 58 female) from a metropolitan airport (Wallston et al., 1978). Mean scores for the IHLC (Internal Health Locus of Control Scale) Form A 25.104, SD 4.4891, Form B 25.304, SD 4.646; PHLC (Powerful Others Locus of Control Scale) Form A 19.991, SD 5.221, Form B 20.974, SD
5.487; CHLC (Chance Locus of Control Scale) Form A 15.574, SD 5.751, Form B 15.461, SD 5. Alpha Reliabilities for the MHLC scales were IHLC Form A .767, Form B .710; PHLC Form A .673, Form B .715; CHLC Form A .753, Form B .691.

Intercorrelation matrix for the MHLC scales demonstrated that the IHLC and PHLC scales were statistically independent, the IHLC and CHLC are negatively correlated, and PHLC and CHLC were positively correlated (Wallston, Wallston, & DeVellis, 1978).

Since the original validation and internal consistency study of the subscales, contradictory information has accumulated (Cooper & Fraboni, 1988). In research that employed samples of medical and dental students (Winefield, 1982), college students (O'Looney & Barrett, 1983), cigarette smokers (Coelho, 1985), alcoholics (Russell & Ludenia, 1983), rehabilitation patients (Umlauf & Frank, 1986), and back care patients (Cooper & Fraboni, 1988), subscale intercorrelations and factor for analysis did not support a clear distinction between scales PHLC and CHLC. Internal consistency reliability, measured by Cronbach's alpha coefficient, has been reported to be as low as .49 for scale CHLC and .58 for PHLC (Winefield, 1982). The IHLC scale has consistently been demonstrated to be stable and homogeneous.
Treatment

Veterans Administration Medical Center

Control group patients at the VAMC outpatient pulmonary clinic were regularly treated by assigned staff pulmonologists. Appointments were scheduled at 1-week to 3-month intervals depending on individual patient conditions. During a patient's regularly scheduled appointment, his current pulmonary status was assessed, with adjustments made to medication regimens as deemed necessary by the physician. Clinic appointments averaged one-half hour in duration.

St. Joseph's Pulmonary Rehabilitation Program

The pulmonary rehabilitation program at St. Joseph's Hospital is a 96-hour course spread over a 16-week period. The experimental group for this study was seen three times per week for sessions of approximately two hours each.

Each program day consisted of two 1-hour modules of monitored exercise training, classes geared to disease-related information, or group counseling sessions tailored to promote positive psychological adjustment to a chronic disease (COPD).

Exercise training programs were individually structured according to individual patients' physical condition and pulmonary capacity. Programs were supervised by a constructed master's degree exercise physiologist.
Each exercise session was monitored. Physiological parameters recorded the physical conditioning modalities used in the exercise training component of the program consisted of graded treadmill ambulation, stationary bicycling, weight training, and flexibility enhancement. The total number program of hours devoted to the physical conditioning module was approximately 32 hours.

The group psychological counseling component consisted of approximately 32 hours of didactic instruction combined with group processing. Psychological counseling modules were supervised and conducted by a master's degree mental health counselor. Areas addressed were directly related to adjustment to COPD. The modules presented, with number of hours devoted to each, were Anger (4 hours), Control Theory (2 hours), Sexuality (2 hours), Stress Management (6 hours), Communication Skills and Relationships (4 hours), Motivation for Changing Behavior (2 hours), Relaxation Training (4 hours), Humor Therapy (1 hour), Self-Evaluation and Future Self-Care Plan (1 hour), Living With Uncertain Prognosis (6 hours), and Crisis Management (2 hours).

The Education component of the rehabilitation program consisted of approximately 32 hours of instruction, concentrated in the following areas: Breathing Retraining, Pulmonary Anatomy and Physiology Medications Used in COPD,
Emergency Care, Pulmonary Diseases, Work Efficiency, Equipment Used in the Treatment of COPD, Medical Management of COPD, Nutrition, Bronchial Hygiene, Activities of Daily Living, Social Services and Communications, Travel, and Leisure-Time Activities. Education-component classes were conducted by a registered respiratory therapist.

Data Analysis

Analyses of the study data was done on SAS program PROC GLM, run on VAX model 4000-300 at the University of Arizona Computer Center.
CHAPTER 4

ANALYSIS AND INTERPRETATION OF DATA

This chapter reports the statistical analyses of collected data. The chapter is divided into four sections. The first presents descriptive statistics and group differences for treatment and control groups. The second section presents post-treatment scores and mean change scores by group. The third presents analysis of post-treatment scores and mean change scores. The fourth section presents research question results.

Subject Data

Data were collected from a total of 70 patients with moderate to severe chronic obstructive pulmonary disease. Thirty-five patients were participants in the St. Joseph's Hospital Pulmonary Rehabilitation Program, Tucson, Arizona. The remaining (35) study subjects were patients receiving standard treatment for chronic obstructive pulmonary disease at the outpatient pulmonary clinic at Veteran's Administration Medical Center, Tucson, Arizona.
Demographic Data

Gender

The sample consisted of 50 men and 20 women. The treatment group at St. Joseph's Hospital consisted of 15 males and 20 females. The control group at the Veteran's Administration Medical Center consisted of 35 males.

Chi-square analysis of pretreatment group difference found a significant group difference for gender, $X^2(1, N = 70) = 28.00, P < .05$.

Age

The mean age of study subjects was 67.4 years, with a standard deviation of ± 7.0 years and a range 49-83 years of age.

Mean age for the treatment group (St. Joseph's Hospital) was 69.8 years, with a standard deviation of ± 5.3 years and a range of 57-80 years.

Mean age of the control group subjects was 65.0 years, with a standard deviation of ± 7.7 years and a range of 49-83 years.

Significance tests for pretreatment group differences using the General Linear Models Procedure found a significant group difference for age, $F(1, 69) = 9.36, P < .05$. 


Educational Level

Mean educational level for the sample was 13.5 years, with a standard deviation of ± 3.0 years. Mean educational level for the treatment group was 13.7 years, with a standard deviation of ± 3.4 years. Mean educational level for the control group was 13.2 years, with a standard deviation of ± 2.6 years.

Significance tests for pretreatment group differences using the General Linear Models Procedure found no significant group differences for educational level, F(1, 67) = 0.75.

Living Situation

Forty-three subjects (61.4%) reported they were living with a spouse; 21 (30.0%) subjects reported they were living alone; 6 subjects (8.6%) indicated living situations other than with a spouse or alone.

Seventeen of the treatment group (48.6%) reported they were living with a spouse; 14 subjects (40.0%) reported they were living alone; 4 subjects (11.4%) reported living situations other than with a spouse or alone.

Twenty-six of the control group (74.3%) reported they were living with a spouse; 7 subjects (20.8%) reported living alone; and 2 control group subjects reported living situations other than with a spouse or alone.
Chi-square analysis of pretreatment group differences found a significant group difference for living with a spouse, $X^2(1, N = 70) = 4.88, P < .05.$

Income

Sixty-four study participants responded to an inquiry regarding annual household income. Results were as follows: 17 participants (26.6%) had incomes below $12,000; 18 (28.1%) reported incomes of more than $12,000 but less than $20,000; 18 (28.1%) reported incomes of more than $20,000 but less than $35,000; and 11 (17.2%) reported household incomes of greater than $35,000 per year.

Annual household income for the treatment group (32 responses) was found in the following frequencies: 4 subjects (12.5%) with incomes of less than $12,000; 9 (28.3%) with incomes of more than $12,000 but less than $20,000; 10 (31.3%) with incomes of more than $20,000 but less than $35,000; and 9 (28.3%) with annual incomes greater than $35,000.

Annual household incomes for the control group were found in the following frequencies: 13 control group subjects (40.6%) reported incomes less than $12,000; 9 control group subjects (28.1%) reported annual income of more than $12,000 but less than $20,000; 8 control group subjects (25%) reported annual household incomes of $20,000 to
$35,000; and 2 subjects (6.25%) reported annual household incomes greater than $35,000.

Chi-square analysis of pretreatment group differences found a significant group difference for income $X^2(3, N = 64) = 9.44, P < .05$.

Pet Ownership

Thirty-seven respondents (52.9%) reported having a pet; 33 (47.1%) reported having no pets. In the treatment group, 21 study participants (60%) reported having a pet while 14 (40%) reported not having a pet. The control group had 16 participants (45.7%) reporting pet ownership; 19 participants (54.3%) reported not having a pet.

Chi-square analysis of pretreatment group differences found no significant group difference for pet ownership, $X^2(1, N = 70) = 1.43$.

Perceived Disease-related Knowledge and Perceived Degree of Impairment

Fifty-one respondents (73.9%) stated that they thought they had adequate knowledge regarding their pulmonary problems; 18 respondents in the sample (26.1%) thought they did not (69 responding).

In the control group, of 34 responses to perceived degree of disease-related knowledge, 29 control group subjects (85.3%) indicated adequate knowledge regarding their pulmonary problems; 5 subjects (14.7%) stated they did not
think they had adequate knowledge regarding their pulmonary problems.

Chi-square analysis for pretreatment group differences for perceived disease-related knowledge found a significant group difference for this variable, $X^2(1, N = 69) = 4.50, P < .05$.

In regard to perceived degree of impairment, the mean score for the entire sample was 1.22, with a standard deviation of 0.46 on a 4-point scale (with 1 indicating "greatly affected," 2 indicating "somewhat affected," 3 indicating "very little," and 4 indicating "not at all affected"). The mean score of 1.22 indicated a moderate to severe degree of perceived impairment.

Mean score of the treatment group on the perceived degree of pulmonary impairment was 1.31, with a standard deviation of 0.53, which indicates a moderate to severe degree of perceived impairment.

Control group mean score for degree of perceived pulmonary impairment was 1.14, with a standard deviation of 0.36, indicating a moderate to severe degree of impairment.

Significance tests for pretreatment group differences using the General Linear Models procedure found no significant group differences, $F(1, 69) = 2.53$, for this variable.
Clinical Information

Mean FEV₁.₀ value for the 70 study participants was 1.04 liters, with a standard deviation of ± 0.6 liters and a range of 0.31 to 2.90 liters. These values indicate a moderate to severe degree of impairment. Sixteen of the study participants (22.9%) were using continuous supplement oxygen while 54 subjects (77.1%) were not.

Mean FEV₁.₀ for the treatment group at St. Joseph's Hospital was 1.03 liters, with a standard deviation of ± 0.4 liters. Ten treatment group participants (28%) were using continuous supplemental oxygen while 25 treatment group participants (72%) were not.

Mean FEV₁.₀ for the control group at the Veteran's Administration Medical Center was 1.04 liters, with a standard deviation of ± 0.7 liters. Six of the control group (17.1%) were using continuous supplemental oxygen; 29 control group members (82.9%) were not.

Significance tests for pretreatment group differences using the General Linear Models procedure found no significant group difference for FEV₁.₀, F(1, 69) = 0.00. Chi-square analysis for pretreatment group differences for continuous oxygen usage found no significant group differences, X²(N = 70) = 1.296.
Multidimensional Health Locus of Control (MHLC)

Pretreatment mean scores and standard deviations for the 70 study participants on the 3 scales of the Multidimensional Health Locus of Control Scale were as follows:
Internal (IHLC) 23.62, standard deviation ± 5.2; Chance (CHLC) 17.55, standard deviation ± 4.8; Powerful Others (PHLC) 23.31, standard deviation ± 4.8.

Pretreatment mean scores and standard deviations on the Multidimensional Health Locus of Control Scale for the treatment group were as follows: Internal (IHLC) 24.57, standard deviation ± 4.5; Powerful Others (PHLC) 22.00, standard deviation ± 4.5; and Chance (CHLC) 16.80, standard deviation ± 4.9.

Pretreatment mean scores and standard deviations on the Multidimensional Health Locus of Control Scale for the treatment group were as follows: Internal (IHLC) 24.57, standard deviation ± 4.5; Powerful Others (PHLC) 22.00, standard deviation ± 4.5; and Chance (CHLC) 16.80, standard deviation ± 4.9.

Significance tests for pretreatment group differences using the General Linear Models Procedure found no significant differences for IHLC F(1, 69) = 2.31, or CHLC, F(1, 69) = 1.76. A significant group difference was found for PHLC, F(1, 69) = 5.53, P < .05.
Sickness Impact Profile (SIP)

Pretreatment mean scores for the entire sample (N = 70) on the scales of the Sickness Impact Profile were as follows: 16.2 on the Psychosocial Scale, 15.0 on the Physical Scale, and 19.5 on the total SIP Score, which encompasses the entire 12 dimensions of the instrument.

Pretreatment mean scores for the experimental group on the Sickness Impact Profile were as follows: Psychosocial scale 14.4; Physical Scale 12.6; and total SIP Score 17.4.

Pretreatment mean scores for the control group on the Sickness Impact Profile were as follows: Psychosocial Scale 18.1; Physical Scale 17.4; and total SIP Score 21.5.

Significance tests for pretreatment group differences found no significant group differences for any of the three scales on the Sickness Impact Profile. Results of the significance tests using the General Linear Models Procedure were as follows: Psychosocial Scale, F(1, 69) = 0.92; Physical Scale, F(1, 69) = 2.71; and Total SIP Score (1, 69) = 1.88.

Summary of Pretreatment Group Differences

Pretreatment group differences were found for the variables of gender, age, income, living situation with spouse, and perceived disease-related knowledge and were
used as covariates in subsequent statistical analyses. In addition, the physiological variables of FEV₁₀, continuous oxygen usage, and the interaction of FEV₁₀ and continuous oxygen usage (FEV₁₀ X oxygen usage) were also used as covariates because of their primary importance in affecting the chronic obstructive pulmonary disease patient.

A summary of descriptive statistics and pretreatment group differences are in Table 1. A summary of the Multidimensional Health Locus of Control Scale (MHLC) and Sickness Impact Profile scores are in Table 2.

**Treatment Effects and Changes Over Time by Group**

**Perceived Degree of Pulmonary Impairment**

The post-treatment mean score for perceived degree of pulmonary impairment by the treatment group was 1.57. Compared to a value of 1.31, this value indicates a reduction of perceived impairment. Mean change score for the treatment group was 0.26. A group-wise univariate analysis of change score found the change score value to be significant at the P < .05 level (t = 3.00).

The control group post-treatment score for perceived degree of pulmonary impairment was 1.31 and a group mean change score of 0.17. Compared to a pretreatment value of 1.14, this value indicates a reduction in perceived degree of pulmonary impairment. A group-wise univariate analysis
Table 1. Summary of descriptive statistics and group differences for the study sample.

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<th>Females</th>
</tr>
</thead>
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<td></td>
<td></td>
</tr>
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**PERCEIVED DEGREE OF DISEASE:**

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<td>37.14</td>
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\[ N = 69 \]
Table 1--Continued

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<td>60.0</td>
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<td>Total</td>
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<td>61.4</td>
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<td>38.6</td>
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* Pretreatment group difference P < .05 level

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<th>Percent</th>
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<td>8.6</td>
<td>64</td>
<td>91.4</td>
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<td><strong>Pet</strong></td>
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<tr>
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<td>60.00</td>
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<td>40.00</td>
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<td>54.29</td>
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<td>Total</td>
<td>37</td>
<td>52.86</td>
<td>33</td>
<td>47.14</td>
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N = 70
Table 1--Continued

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<th>Income*</th>
<th>Under 12K</th>
<th>12,000-20,000</th>
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<td>9</td>
<td>10</td>
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<td>Control group</td>
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<td>9</td>
<td>8</td>
<td>2</td>
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<tr>
<td>Total</td>
<td>17</td>
<td>18</td>
<td>18</td>
<td>11</td>
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**N = 64**

* Pretreatment group difference significant at the *P < .05* level

**SUPPLEMENTAL OXYGEN USAGE:**

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<td>Treatment group</td>
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<td>28.57</td>
<td>25</td>
<td>71.43</td>
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<td>82.86</td>
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<td>Total</td>
<td>16</td>
<td>22.9</td>
<td>54</td>
<td>77.1</td>
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**N = 70**

<table>
<thead>
<tr>
<th>N</th>
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<tr>
<td><strong>FEV1.0</strong></td>
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<tr>
<td>Control group</td>
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<td>1.04</td>
</tr>
<tr>
<td>Total</td>
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<td>1.03</td>
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</table>
Table 2. Summary of pretreatment scores for Multidimensional Health Locus of Control Scale and Sickness Impact Profile.

<table>
<thead>
<tr>
<th></th>
<th>IHLC</th>
<th>Std. Dev.</th>
<th>CHLC</th>
<th>Std. Dev.</th>
<th>PHLC*</th>
<th>Std. Dev.</th>
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<tbody>
<tr>
<td><strong>Multidimensional Health Locus of Control Scale (MHLC)</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Treatment group</td>
<td>24.57</td>
<td>±4.5</td>
<td>16.80</td>
<td>±4.9</td>
<td>22.0</td>
<td>±4.5</td>
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<tr>
<td>Control group</td>
<td>22.68</td>
<td>±5.7</td>
<td>18.31</td>
<td>±4.5</td>
<td>24.62</td>
<td>±4.8</td>
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<tr>
<td>Total sample</td>
<td>23.62</td>
<td>±5.2</td>
<td>17.55</td>
<td>±4.8</td>
<td>23.31</td>
<td>±4.8</td>
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<tr>
<td><strong>Sickness Impact Profile (SIP)</strong></td>
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<tr>
<td>Treatment group</td>
<td>14.4</td>
<td></td>
<td>12.6</td>
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<td>17.4</td>
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<td>Control group</td>
<td>18.1</td>
<td></td>
<td>17.4</td>
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<tr>
<td>Total sample</td>
<td>16.2</td>
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<td>15.0</td>
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<td>19.5</td>
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</table>

* Pretreatment group difference

P < .05 level
for the mean change score found the value to be nonsignificant at the \( P \leq 0.05 \) level (\( t = 1.97 \)).

**Multidimensional Health Locus of Control Scale (MHLC)**

The post-treatment mean scores, standard deviations, and mean change scores for the treatment group on the Multidimensional Health Locus of Control Scale (MHLC) were as follows: Internal (IHLC) 24.2, standard deviation \( \pm 3.98 \), and a mean change score of 0.37; Powerful Others (PHLC) 20.8, standard deviation \( \pm 4.36 \), and a mean change score of -1.17; Chance (CHLC) 16.8, standard deviation \( \pm 4.2 \), and a mean change score of -0.03.

Group-wise univariate analysis of mean change scores found no statistically significant values for Internal (IHLC), Chance (CHLC), or Powerful Others (PHLC) at the \( P \leq 0.05 \) level.

Post-treatment mean scores standard deviations and mean change scores for the control group on the Multidimensional Health Locus of Control Scale were as follows: Internal (IHLC) 21.0, standard deviation \( \pm 4.4 \), and mean change score -1.71; Powerful Others (PHLC) 23.8, standard deviation 4.6, and mean change score -0.74; Chance (CHLC) 18.2, standard deviation 5.9, and mean change score -0.08.

Group-wise univariate analysis of mean change scores found no statistically significant values for Internal
(IHLC), Chance (CHLC), or Powerful Others (PHLC) at the P < .05 level.

**Sickness Impact Profile (SIP)**

Experimental group post-treatment mean scores for the Sickness Impact Profile were: Psychosocial Scale 7.9, with mean change score of 6.5; Physical Scale 7.6, with a mean change score of -5.0; and total SIP score 10.9, with a mean change score of -6.5.

Group-wise univariate analysis of mean change scores found values statistically significant at the P < .05 level for the Psychosocial Scale (SIP), $t = -4.58$; Physical Scale (SIP), $t = -5.07$; and Total SIP score, $t = -6.98$.

Control group mean scores and mean change scores for the Sickness Impact Profile were: Psychosocial Scale 19.3, with a mean change score of 1.2; Physical Scale 18.1, with a mean change score of 0.7; and total SIP score 21.1, with a mean change score of -0.5.

Group-wise univariate analysis of mean change scores found no statistically significant values at the P < .05 level for the Psychosocial Scale, Physical Scale, or Total SIP score.

A summary of pretreatment mean scores, post-treatment mean scores, and mean change scores by group is presented in Table 3.
Table 3. Summary of pretreatment mean scores, post-treatment mean scores, and mean change scores by group.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pretreatment Mean Score</th>
<th>Post-treatment Mean Score</th>
<th>Mean Change Score</th>
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<tbody>
<tr>
<td><strong>Control Group</strong></td>
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<tr>
<td>(VAMC Outpatient Pulmonary Clinic; N = 35)</td>
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<tr>
<td>Perceived Impairment</td>
<td>1.14</td>
<td>1.31</td>
<td>0.17</td>
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<tr>
<td>Internal (IHLC)</td>
<td>22.68</td>
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<td>Powerful Others (PHLC)</td>
<td>24.62</td>
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<td>Psychosocial Scale (SIP)</td>
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<td>Psychosocial Scale (SIP)</td>
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<td>-6.5*</td>
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<td>Total SIP Score</td>
<td>17.4</td>
<td>10.9</td>
<td>-6.5*</td>
</tr>
</tbody>
</table>

* Significant at the P < .05 level
Analysis of Post-Treatment Group Differences

Analysis of post-treatment group differences was conducted using a hierarchal GLM analysis with priority given to covariates and error terms based on a within-subjects design (Keppel, 1982).

Certain demographic variables were removed as covariates from the statistical analysis as these variables were found to be consistently lacking in significant statistical relationship (correlation) with the dependent measures used for this study. Demographic variables removed from the analysis were: living situation (alone), living situation (other than alone or with spouse), and pet ownership.

The variables of perceived disease-related knowledge and perceived impairment were also removed as covariates from the statistical analysis. These exploratory measures were based on simple self-report and did not adequately discriminate between groups. Difficulties were probably related to psychometric problems as opposed to theoretical considerations. The fact that these simple unitary measures were not productive suggest that unitary global assessment was not an appropriate method to measure this population. An enriched multidimensional measure such as the Sickness Impact Profile was more appropriate for use with the study population.
Multidimensional Health Locus of Control Scale (MHLC)

Internal Health Locus of Control (IHLC)

Analysis for post-treatment differences on Internal Health Locus of Control (IHLC) of the MHLC found no effect for time, \( F(1, 59) = 2.06 \) and no effect for group X time interaction (treatment) \( F(1, 59) = 1.71 \). A significant difference was found for group \( F(1, 59) = 4.91, P < .05 \).

Follow-up testing showed that there was no significant difference pretreatment; however, a significant difference existed post-treatment. Analysis of group mean change scores indicated that no significant change was made by either group. Thus, the difference can probably be attributed to random drift in scores. After treatment, control group scores were lower in IHLC than the treatment group but the difference appears to be trivial.

Chance Health Locus of Control (CHLC)

Analysis for post-treatment differences on the Chance Health Locus of Control (CHLC) of the MHLC found no effect for group \( F(1, 65) = 0.39 \); time \( F(1, 57) = 0.69 \); or group X time interaction, \( F(1, 57) = .85 \).
Powerful Others Health Locus of Control

Analysis for post-treatment differences in Powerful Others Health Locus of Control (PHLC) on the MHLC found no effect for time \( F(1, 57) = 1.70 \) and no effect for group X time (treatment) interaction, \( F(1, 57) = 0.52 \). A significant difference was found for group \( F(1, 65) = 6.50, P < .05 \). Followup t-tests showed that significant differences existed both pre- and post-treatment. Analysis of group mean change scores indicated that no significant change was made by either group. Post-treatment PHLC scores for both groups declined.

Sickness Impact Profile (SIP) Psychosocial Scale

Analysis for post-treatment differences for the Psychosocial Scale of the SIP found no effect for group, \( F(1, 65) = 2.87 \). A significant effect was found for time \( F(1, 57) = 10.35, P < .05 \), and for group X time interaction (treatment) \( F(1, 57) = 6.47, P < 0.5 \). Thus, pretreatment scores indicated no significant group differences; post-treatment results indicated a significant interaction effect such that treatment group scores showed a lessened degree of impairment than the control group. Analysis of group mean change scores indicated no significant difference in control group mean change scores but a significant decrease in treatment group mean change scores.
**Physical Scale**

Analysis for post-treatment differences on the Physical Scale of the SIP found no effect for group $F(1, 65) = 3.88$. A significant effect was found for time, $F(1, 59) = 10.26$, $P < .05$ and group X time interaction (treatment), $F(1, 59) = 6.90$, $P < .05$. Pretreatment scores indicated no significant group differences. Post-treatment results indicated a significant interaction effect such that the treatment group showed a lessened degree of impairment than the control group. Analysis of group mean scores indicates no significant difference in control group mean change scores but a significant decrease in treatment group mean change scores.

**Total SIP**

Analysis for the total SIP score found significant effects for group, $F(1, 65) = 4.15$, $P < .05$; time $F(1, 59) = 24.34$, $P < .05$; and group X time (treatment) $F(1, 59) = 8.43$, $P < .05$. Pretreatment scores indicated no significant group differences. Post-treatment results indicated a significant interaction effect such that the treatment group demonstrated a lessened degree of impairment encompassing the entire 12 dimensions of this instrument than the control group. Analysis of group mean change scores indicated no significant difference in control group scores but a significant decrease in treatment group mean change scores.
Research Questions and Results

Research questions to be addressed were as follows:

1. To what degree participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component would (1) generally produce a shift in persons from an external locus of control toward an internal locus of control and (2) specifically decrease the perception of chance, fate, or powerful others to influence and determine personal health.

2. To what degree participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component would result in a lessening of perceived negative effects of the physiological and psychological concomitants of chronic obstructive pulmonary disease.

Findings

Tests of the two research questions produced the following results:

1. Participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component did not (1) produce a significant shift in participants from an external locus of control toward an internal locus of control and (2) specifically produce a significant decrease in the
perception of chance, fate, or powerful others to influence and determine personal health.

2. Participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component did significantly produce a lessening of perceived negative effects of the physiological and psychological concomitants of chronic obstructive pulmonary disease as measured by the Sickness Impact Profile.
CHAPTER 5

SUMMARY, DISCUSSION, AND
RECOMMENDATIONS FOR FUTURE STUDY

This chapter is organized into three sections: (1) a summary broadly restating the problem, methodological approach, and findings of the study; (2) a discussion of the study results; and (3) recommendations for future research.

The study was designed to examine the relationship between participation in a comprehensive pulmonary rehabilitation program, locus of control, and the psychological and social concomitants of chronic obstructive pulmonary disease.

The study investigated the following questions: to what degree participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component (1) would generally produce a shift in persons from an external locus of control toward an internal locus of control; (2) specifically decrease the perception of chance, fate, or powerful others to influence and determine personal health; and (3) will result in the lessening of perceived negative effects of the psychological and social concomitants of chronic obstructive pulmonary disease.
Two sample groups were evaluated in the study. The first group was comprised of 35 moderate to severe COPD patients, enrolled in a comprehensive pulmonary rehabilitation program at St. Joseph's Hospital in Tucson, Arizona. The pulmonary rehabilitation group served as the study's treatment group. The second sample group was comprised of 35 male moderate to severe COPD patients receiving standard medical treatment at the Veteran's Administration Medical Center outpatient pulmonary clinic, Tucson, Arizona. The Veteran's Administration Medical Center group served as the study's control group.

Research instruments used for the study were: The Multidimensional Health Locus of Control Scale (Wallston, Wallston, & DeVellis, 1978), The Sickness Impact Profile (Bergner et al., 1981), and a demographic inquiry. The instruments were administered to each study group at approximately 16-week intervals. The treatment group was given the research instruments at the initial session for the rehabilitation program and again at program completion 16 weeks later. Five consecutive rehabilitation program groups were used to form the 35-patient sample. The control group was initially administered the research instruments while waiting for outpatient pulmonary clinic appointments. Followup administration was done 16 weeks later by mail,
with completed data returned to the pulmonary medicine section at the Veteran's Administration Medical Center.

Results of the study indicated that participation in a comprehensive pulmonary rehabilitation program emphasizing a psychosocial component did not produce a significant shift in program participants from an external locus of control toward an internal locus of control nor did it produce a significant decrease in the perception of chance fate or powerful others to influence and determine personal health. However, study results indicated that participation in a comprehensive pulmonary rehabilitation emphasizing a psychosocial component did produce a significant lessening of perceived negative effects of the psychosocial and physiological concomitants of chronic obstructive pulmonary disease as measured by the Sickness Impact Profile.

Discussion of Results

Locus of Control

The study investigated possible relationships between shifts in locus of control and participation in a comprehensive pulmonary rehabilitation program. Prior to this investigation, a search of relevant literature revealed no studies that specifically examined this topic.

In a related study, Howland et al. (1986) used the less specific Health Locus of Control Scale (HLC) to study the effects of a 6-12 hour COPD community-based education
program for COPD patients. Howland et al.'s findings of a slight shift toward "internality" were accompanied by a finding of no change in perceived health status (using the Sickness Impact Profile as a dependent measure). The author agrees with the study's conclusion that the shift toward an internal locus of control, while statistically significant, was of doubtful clinical value. Results of the present study appear to agree with Howland et al.'s conclusion that a comprehensive approach that combines education with physical and psychosocial rehabilitation is necessary to bring about improvement in health status.

A theoretical question raised by the study results concerns the use of generalized expectancy measures (locus of control) versus specific expectancy measures (self-efficacy). The study results, while noting improvement in perceived health status by program participants, fails to delineate what mediated the changes in perception. The fact that no significant relationship existed between program participation and locus of control shifts (despite improvement in perceived health status) suggest that perhaps a measurement instrument tailored to specific expectancies (self-efficacy) might be better suited than a generalized measure of expectancies (locus of control) used for this study.
Kaplan, Atkins, and Reinsch (1984) successfully used a specific expectancy (self-efficacy) measure to document improvement change in an exercise program for COPD patients. The self-efficacy measure associated improvement with enhanced expectations for performing positively in the future. The self-efficacy measure was more closely associated with change than was the Health Locus of Control Scale (HLC) which was used as a comparison measure.

Bandura's self-efficacy theory suggests that assessment should consist of direct estimates of performance in specific situations (Bandura, 1977). Bandura's self-efficacy theory states that internal control embraces two very different attributions: (1) the belief that the recommended behavior will lead to favorable outcome (outcome expectation) and (2) the belief that the behavior required to produce the outcome can be executed (efficacy expectation).

A theoretical approach similar to the above used in future studies of this nature might yield data not only concerning expectancy assessment but also specific data delineating mediators of changes in expectancies.

**Sickness Impact Profile as a Measure of Treatment Outcome**

The developers of the Sickness Impact Profile (Bergner et al., 1981) suggested that the instrument be used
as an outcome measure of health care treatment interventions. Review of the relevant literature found no previous studies of comprehensive pulmonary rehabilitation programs using the Sickness Impact Profile as a measure of the effects of treatment.

The Sickness Impact Profile has been used on three previous occasions as an outcome measure in treatment studies involving chronic obstructive pulmonary disease patients other than in rehabilitation programs. The Nocturnal Oxygen Therapy Trial Group (1980), the Intermittent Positive Pressure Trial Group (1983), and Bergner et al. (1988), in a study of the cost and efficiency of home care for COPD patients, have employed the SIP as a measure of treatment outcome. None of the previous trials produced a significant difference in SIP score between treatment groups and control groups.

SIP values obtained for the patient population in this investigation were consistent with values obtained for similar moderate to severe COPD patients used as subjects in the previous studies employing the SIP as an outcome measure.

In the opinion of the author, the relatively short administration time, lack of special training needed for administration, convenient mode of administration, acceptability to subjects, and ability to effectively document
changes in perceived health status made the Sickness Impact Profile a practical, effective research instrument.

Comprehensive Pulmonary Rehabilitation Program Participation

An original postulate for this research study was that the psychosocial emphasis in a comprehensive pulmonary rehabilitation program would be a dominant factor in influencing a lessened perception of the negative psychological and social concomitants of chronic obstructive pulmonary disease.

Previous studies have demonstrated subjective benefits to COPD patients participating in rehabilitation and therapy programs involving the three major areas of instructional concentration emphasized in the St. Joseph's Hospital Pulmonary Rehabilitation Program (Agle, Baum, & Chester, 1973; Dudley et al., 1980; Wright et al., 1983; Kaplan, Ries, & Atkins, 1985; Guyatt, Berman, & Townsend, 1987; Ries, 1991). However, published studies involving comprehensive pulmonary rehabilitation programs that provided the amount of specialized attention (32 hours of instruction) to the psychological and social concomitants of COPD, as did the St. Joseph's program, were not located.

The lessened perception of psychological and social impairment by the treatment group, as in the present study, measured by the Psychosocial Scale of the Sickness Impact
Profile, cannot be directly attributed to the strong psychosocial treatment intervention provided by the St. Joseph's program. Only a study that specifically assesses the individual effectiveness of the educational, physical training, and psychosocial components within the program format might provide such a conclusion. Based on this fact, in the opinion of the author the positive impact of the rehabilitation program intervention is directly attributable to the interaction of the three major treatment components. Thus the potentially synergistic effect of these three major treatment components would preclude a further investigation in the form of decomposition studies.

Study results reflected a treatment effect (group X time) for the treatment group on the Psychosocial Scale, Physical Scale, and total SIP score (encompassing 12 dimensions). No effect for treatment (group X time) was found for the control group. Results appear to indicate that the treatment group receiving comprehensive pulmonary rehabilitation perceived a lessened effect of the psychological, social, and physiological concomitants of chronic obstructive pulmonary disease. The control group receiving standard medical treatment for their COPD essentially remained the same in their perceptions of these same areas, as measured by the Sickness Impact Profile.
While the two groups sampled in this study differed before treatment in gender, age, income, living situation with spouse, perceived disease-related knowledge, and score on the Power Others Scale of the Multidimensional Health Locus of Control Scale, these pretreatment group differences were statistically controlled for in the subsequent analysis of data.

**Implications of the Study and Recommendations for Future Investigation**

Comprehensive pulmonary rehabilitation programs have demonstrated their effectiveness for COPD patients by providing an improved quality of life by reducing the negative impact of the physical, psychological, and social symptomatology. Comprehensive pulmonary rehabilitation programs have also been shown to be a viable means to reduce health care costs by reducing the amount of facility and personnel resources needed to treat the COPD patient.

The results of the present study represent a contribution to the current literature regarding treatment outcomes in comprehensive pulmonary rehabilitation programs. The study also provided data on the use of a generalized expectancy measure (the Multidimensional Health Locus of Control Scale) in comprehensive pulmonary rehabilitation programs and data regarding the use of a quality of life instrument (the Sickness Impact Profile) as a treatment
outcome measure in a comprehensive pulmonary rehabilitation program.

On the basis of results obtained from the present investigation and the desire to contribute to the efficacy of treatment in comprehensive pulmonary rehabilitation programs, the following recommendations for future research and program implementation are made.

Recommendations for Future Research

1. Further investigation of expectancy theory as applied to comprehensive pulmonary rehabilitation programs.

2. Further investigation into the mediators of behavioral change in chronic obstructive pulmonary disease patients.

Recommendations for Program Implementation

1. Development of outcome and evaluation measures that document cost-containment features of comprehensive pulmonary rehabilitation programs as a treatment modality for chronic obstructive pulmonary disease.

2. Development of an ongoing pulmonary rehabilitation format that addresses the progressive nature of chronic obstructive pulmonary disease. Such a program would include patients, caregivers, and family.
Generalizability of the study results is limited to the individuals who were willing to participate in the investigation. However, study findings suggest that further investigations into treatment outcomes of comprehensive pulmonary rehabilitation programs may yield data that will be of benefit to all chronic obstructive pulmonary patients.
REFERENCES


