Quality of Life in Chronic Obstructive Pulmonary Disease

By

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ABSTRACT

Title:	Quality of Life in Chronic Obstructive Pulmonary Disease
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This cross-sectional, observational study sought to identify factors influencing quality of life in chronic obstructive pulmonary disease (COPD), and to identify intervening variables that mediated the effects of these factors on life quality. Using a framework derived from the stress, coping, and adaptation theory of Lazarus and Folkman (1984), variables were placed in a proposed model of quality of life in COPD. The major study hypotheses were that demographic (age, socioeconomic status) and disease (disease severity, dyspnea, and functional status) variables would have only indirect effects on quality of life, and that the mediating variables (depression, anxiety, self-esteem, dispositional optimism, and social support) would have direct effects on quality of life.

A sample of 126 patients (mean age = 68.1 ± 7.4 yrs.; 54.8% female; 96.8% Caucasian) with COPD (FEV_1% M = 39.52 ± 14.49) was recruited from a large private medical specialty practice. Subjects completed a brief interview and a written questionnaire, and performed a 6-minute walk test. If results of spirometry were not available within the previous 12 months, simple spirometry was also performed. Data were analyzed using path analysis, with standardized path coefficients judged to be significant at $\alpha = .05$.

The model explained 53% of the variance in quality of life. The major study hypotheses were partially supported. Three mediating variables (depression, self-esteem, and social support) and one antecedent variable (age) had direct effects on quality of life. Two antecedent variables, disease severity and functional status, had significant total, though indirect effects on quality of life.

These findings are in agreement with those of Burckhardt (1985), who found that psychosocial variables mediated the relationships between disease and demographic variables and quality of life in arthritis patients. The findings suggest that nurses in clinical practice with COPD patients must attend to the psychosocial aspects of care, particularly when little improvement is possible in the physiologic state of the patient. Specifically, nurses must develop interventions to enhance self-esteem and improve perceived social support in COPD patients.

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CHAPTER 1

Introduction

Interest in how people perceive the quality of their lives has grown in recent years as a result of several factors. Life expectancy has increased, accompanied by a greater prevalence of chronic illnesses among those living longer. Quality of life concerns have also expanded with the development of aggressive new therapies that can have significant adverse effects, and the recognition that some people will choose to forego life-extending treatment if they believe their life quality will be significantly reduced by it (Levine, 1990). Thus, health care providers have become increasingly concerned not only with continuing to extend the number of years of life, but also with helping people maintain or improve the quality of those years (Lawton, 1991).

Chronic Obstructive Pulmonary Disease

One chronic illness that has the potential to affect quality of life adversely is chronic obstructive pulmonary disease (COPD). COPD is defined by the American Thoracic Society ([ATS], 1987b) as "a disorder characterized by abnormal tests of expiratory flow that do not change markedly over periods of several months observation" (p. 235). Reductions in forced vital capacity (FVC), forced expiratory volume in the first second of the FVC (FEV_1), and FEV_1/FVC ratio all provide evidence of airflow obstruction

(West, 1987). COPD consists primarily of emphysema or chronic bronchitis, or a combination of these two disease entities in the individual patient. There may be a degree of reversibility to the airflow obstruction not unlike that which occurs in asthma.

The hallmark of COPD is dyspnea, a distressing symptom that can lead to severe functional limitation and to the psychological consequences of anxiety and depression (Dudley, Glaser, Jorgenson, & Logan, 1980a; West, 1987). Airway irritation, with subsequent hyperplasia of mucous glands and excessive mucus production, results in a productive cough. In the late stages of the disease, ventilation-perfusion abnormalities often result in hypoxemia and, in some cases, hypercapnia (ATS, 1987b; West, 1987).

COPD is a leading cause of morbidity and mortality in the United States, affecting approximately 13.4 million individuals, and resulting in almost 75,000 deaths each year (American Lung Association, 1987). COPD develops over a period of 20 or more years of cigarette smoking, and has a long asymptomatic period and a duration of many years, so that advanced COPD is primarily a problem of older people.

Quality of Life

Quality of life is the subjective perception of satisfaction with life in domains of importance to the individual (Oleson, 1990). The domains identified by

Flanagan (1978) were adopted for this study: physical and material well-being; relations with other people; social, community, and civic activities; personal development and fulfillment; and recreation. A sixth domain, independence, was also included in the definition of quality of life because the ability to maintain independence has been identified as an important dimension of life quality in older people (Williams, 1990) and in those with chronic illnesses (Burckhardt, Woods, Schultz, & Ziebarth, 1989).

Previous Research

Both the symptoms of COPD and responses to the disease have been linked to reduced life quality in previous research (Brown, Rawlinson, & Hilles, 1981; McSweeny, Grant, Heaton, Adams, & Timms, 1982; Moody, McCormick, & Williams, 1990, 1991; Prigatano, Wright, & Levin, 1984; Schrier, Dekker, Kaptein, & Dijkman, 1990). Numerous studies have sought to identify factors that predict quality of life in COPD patients, including variables related to disease severity, functional impairment, and psychosocial status. Some investigators have concluded that although variables related to disease severity and functional impairment do influence quality of life, the psychological and social variables must mediate their influence, since there is wide variability in individual ratings of life quality despite similar disease and demographic characteristics among patients (McSweeny et al., 1982; Schrier et al., 1990).

Clinical Observations

Clinical observations made by the investigator while working with COPD patients demonstrated that despite objectively similar disease characteristics (i.e., expiratory flow rates, arterial blood gas values, and symptom severity), people responded in a variety of ways to the challenges posed by the disease. These observations suggested that it was not the disease itself, but rather some psychological characteristics residing within individual patients that determined how quality of life was perceived. This hypothesis was in agreement with the suggestions made by the researchers described above, and with them, led to the development of the theoretical model tested in this study.

Theoretical Framework

The suggestion that psychosocial variables mediate the relationships between disease and demographic factors and quality of life in COPD is consistent with the cognitive theory of stress and coping put forth by Lazarus and Folkman (1984). These theorists have suggested that stress resides not within an event or encounter itself, but instead is the result of an interaction between an event and an individual. Each person brings to a given situation a reserve of coping resources that determine, in part, the efforts expended in managing a stressful encounter. These coping resources, as well as some of the possible psychological consequences of

COPD, were viewed as mediating psychosocial variables in this investigation.

Purpose of the Study

Synthesis of the cognitive theory of stress and coping, clinical observations, and previous research results served as the basis for the design of the current investigation. Specifically, this investigation had two major purposes: (1) to identify factors that influence quality of life in COPD; and (2) to identify intervening variables that mediate the effects of these factors on COPD patients' perceptions of quality of life. The general hypotheses to be tested were that disease and demographic variables would have no direct effect on quality of life, but would influence quality of life indirectly through mediating variables, and that the mediating variables would have a direct effect on quality of life.

Significance for Nursing

Identification of factors that influence quality of life in COPD has the potential to give direction to the development of nursing interventions that may improve life quality in COPD. Because in this study it was the mediating variables that were hypothesized to have direct effects on quality of life, interventions aimed at these variables would be expected to have the greatest impact in improving life quality. For example, while dyspnea itself remains a fairly intractable symptom, nursing interventions directed at coping with the emotional distress associated with dyspnea might prove more effective than interventions aimed at the physical components of the symptom. Enhancing coping effectiveness by improving the quality of the patient's perceived social support is one example of such an intervention (Kohlman-Carrieri & Janson-Bjerklie, 1990).

CHAPTER 2

Review of the Literature and Theoretical Framework

Considerable disagreement exists both within and between health care disciplines about how the concept of quality of life should be defined and measured. The first section of this chapter will review some of the early social science literature related to this issue and establish the conceptual basis for the definition and measurement of quality of life adopted for this investigation. Next, a brief overview of findings from the gerontological literature relating to quality of life in older people will be given. In the last part of this chapter section, the existing literature related to quality of life in COPD will be critiqued, with particular emphasis on establishing the conceptual basis for the present study.

The second major chapter section will describe the theoretical framework for this investigation, that is, the cognitive theory of stress and coping proposed by Lazarus and Folkman (1984). The chapter will conclude with a description of the proposed model of quality of life in COPD to be tested in this study, including a discussion of the rationale for variable selection and placement in the model and for the relationships hypothesized by the model.

Review of the Literature

Before quality of life caught the attention of scientists in health care disciplines (such as physicians and nurses), the concept had been explored extensively by social scientists. Although it was assigned a variety of labels, such as life satisfaction and subjective well-being, the underlying concept being explored was the happiness or satisfaction people had with various aspects of their lives. To provide background for the conceptual definition of quality of life and, to a lesser extent, the selection of variables in the current study, two major lines of this early research will be reviewed briefly below. The first group of studies was conducted by sociologists and attempted to define life satisfaction across the broad spectrum of Americans. The second group of studies was conducted primarily by social and psychological gerontologists, and focused specifically on life satisfaction in older people.

Quality of Life in General Populations

Although they were not the first to explore the idea of quality of life, Campbell, Converse, and Rodgers (1976) conducted a major study that had an important influence on subsequent work, including the present investigation. These authors observed that, despite dramatic improvement in the objective conditions of American life in the post-war period (e.g., increases in real wages, availability of leisure time, accumulation of material possessions), people were no more satisfied with their lives than they had been in the past. Thus, Campbell et al. (1976) noted the need to examine how people experienced their lives rather than simply measuring the objective, or external, conditions of life.

These authors (Campbell et al., 1976) conceptualized quality of life as a reflection of the extent to which needs were satisfied, acknowledging that each individual brings a unique set of standards of comparison, aspirations, and expectations to the evaluation of life satisfaction. They also noted that individual personal characteristics, such as age, race, income, outlook on life (optimism or pessimism), and other personality attributes influenced the evaluation of life satisfaction.

In this study (Campbell et al., 1976), both global life satisfaction and life satisfaction in 15 discrete domains were examined. The specific domains were: marriage, family life, health, neighborhood, friendships, housework, job, life in the United States, life in the city or county, non-work activities, housing, usefulness of education, standard of living, amount of education, and savings.

One interesting finding from the measurement of general sense of well-being was that life satisfaction increased with age. The authors suggested that this tendency may have been due to the progressive movement of people over the life span into objectively better situations, an improvement in the fit between individual needs and the niche a person actually occupied in life, or the fact that people accommodated to their situations, that is, they adjusted their expectations to the reality they had to live.

Campbell et al. (1976) also found a tendency for satisfaction with specific life domains to increase with age, the one exception being a marked decline in satisfaction with health. The authors hypothesized that although older people had accommodated over the years to the circumstances of their lives in most domains, health alterations occurred later in life and they had had insufficient time to adjust to them.

Andrews and Withey (1974, 1976), not wishing to make a clear distinction between objective and subjective indicators of well-being, developed a conceptual approach to the measurement of quality of life that "assumed that people implicitly--and sometimes explicitly--engage in a process of evaluation in which events occurring in a role-specific situation are evaluated according to a set of values to produce an affective response" (1974, p. 3). In their schema, evaluations of life quality in specific role-related domains were integrated to yield a "global affective response to life-as-a-whole" (1974, p. 3), or perceived quality of life.

Some 100 domains or concerns considered significant to most Americans were identified from reviews of national survey data, structured interviews with individuals, and the literature. These concerns were subsequently reduced by cluster analysis to 30 specific life domains that were then used to predict global quality of life. A series of regression analyses revealed that 12 domains accounted for all of the power to predict global life quality: satisfaction with self, family life, money, amount of fun, housing, things you do with your family, time to do things, spare time activities, national government, goods and services, health, and job. These 12 domains explained over 50% of the variance in global quality of life (Andrews & Withey, 1974).

An interesting and important facet of Andrews and Withey's (1974, 1976) work was the development of the Delighted-Terrible scale for rating satisfaction within each domain. Burckhardt, Woods, Schultz, & Ziebarth (1989) later incorporated the rating scale into the Quality of Life Scale, the measure used to operationalize quality of life in the present study.

Shin and Johnson (1978) sought to develop a framework for explaining self-assessed happiness, which they defined as a "global assessment of a person's quality of life according to his own chosen criteria" (p. 478). The sources of happiness were hypothesized to be "possession of resources, the satisfaction of needs, wants, and desires, participation in self-actualizing activities, and comparisons with others and past experience" (p. 479). Their results indicated that most of the variance in self-assessed happiness was explained by the satisfaction of needs and wants, a favorable comparison of one's life situation with others', and, less importantly, the possession of resources. They concluded that happiness is a concept best evaluated in relation to individuals because it is based upon a perception of individuals' needs and resources in the context of a unique culture and environment (Shin & Johnson, 1978, p. 491).

As part of a research effort aimed at improving the quality of life in the United States, Flanagan (1978) first attempted to define the concept and develop an instrument for measuring it. The domains of life quality were inductively derived from an analysis of 6500 critical incidents related by 3000 Americans in response to questions about satisfying or "bad" experiences they had witnessed recently, ongoing sources of pleasure in life, positive and negative emotional experiences, and the like. Responses were categorized into 15 behaviors and experiences that fell into five major domains: physical and material well-being; relations with other people; social, community, and civic activities; personal development and fulfillment; and recreation.

Large samples (n = 600 in each group) of 50 and 70 year-olds were then asked to rate the importance of each of the 15 factors in defining quality of life, and how well each factor was met in their own life. About 85% of respondents rated their quality of life as good or better, with similar results found in all gender and age groups.

Health and personal safety was rated as important by more than 95% of respondents, with having and raising children and understanding yourself important to more than 80% of the sample. Next in importance were a close relationship with a spouse and material comforts. Both age groups identified material comforts as a factor that tended to make their quality of life poor, with 70 year-olds also mentioning health, learning, and active recreation, and 50 year-olds naming learning, health, and participation in local and national government. Finally, Flanagan (1978) found that material comforts, health, active recreation, work, learning, and creative expression had the highest correlations with overall quality of life.

Taken together, the studies described above support a conceptualization of quality of life that is based on individual self-perception, and represents satisfaction or happiness with life across a broad spectrum of domains. A similar conclusion was reached by Oleson (1990) in a concept analysis of subjectively perceived quality of life. She defined the concept as "a cognitive experience manifested by satisfaction with life domains of importance to the individual and an affective experience manifested by happiness with important life domains" (p. 188).

Although the relative importance of different domains in determining overall quality of life varies among studies, the domains identified have been remarkably consistent.

This fact will prove to be of interest later when the literature related to quality of life investigations in COPD are reviewed.

Quality of Life in Older Populations

An extensive body of literature related to life satisfaction or subjective well-being in older people has been built over the past 30 years by social and psychological gerontologists. This body of literature has been reviewed (Larson, 1978) and critiqued (George, 1981; Larson, 1978). A review of the literature on subjective well-being across all age groups by Diener (1984) is also of interest here. The present review will provide an overview of some of the findings from this research that are important to a health-related study of quality of life.

Investigators have examined a multitude of demographic, social, psychological, and health-related variables in their attempts to explain quality of life in older people. In agreement with Flanagan's (1978) finding that more than 95% of people in a general population rated health as an important determinant of quality of life, Edwards and Klemmack (1973), Markides and Martin (1979), and Palmore and Luikart (1972) all found that self-rated health correlated significantly with subjective well-being. Based on his review, Larson (1978) estimated the correlation between health and subjective well-being in older people to be .2 to .4, with the corresponding proportion of variance in well-being accounted for by health equal to 4% to 16%. A meta-analysis of 104 studies examining zero-order correlations between self-rated health and subjective well-being in older people found a mean effect size of slightly greater than .3 (95% confidence interval .29 to .35; Okun, Stock, Haring, & Witter, 1984).

Edwards and Klemmack (1973) found that socioeconomic status was the most important predictor of life satisfaction in a rural sample over 45 years of age, and Palmore and Luikart (1972) found a moderate relationship between income and life satisfaction in 502 45 to 69 year-olds in North Carolina. However, in the latter study, this relationship was strongest when income was below average; once an average income was achieved, the effect was less important.

A number of other variables have been examined for their ability to predict quality of life in older people, including demographic (age, gender, marital status, race), social activity or social contact, life events, and personality variables (Edwards & Klemmack, 1973; Markides & Martin, 1979; Medley, 1976; Palmore & Luikart, 1972; Palmore, Cleveland, Nowlin, Ramm, & Siegler, 1979). Results have been conflicting, and when effects have been found, they have been small to moderate in size (Diener, 1984; Larson, 1978). Two personality variables that have been found to predict quality of life consistently are self-esteem and internality, or the belief that what happens to one is the result of one's own actions (Diener, 1984).

A major limitation of most studies has been their correlational nature, and all reviewers of this body of work have noted that quality of life could just as well predict many of the hypothesized predictor variables as the reverse (Diener, 1984; George, 1981; Larson, 1978). A second limitation of these studies is their relative simplicity. Even when path models were used to test sociological theories, few predictor variables (usually three or four) were hypothesized to predict life satisfaction. In contrast, other studies entered as many as 17 predictor variables in a stepwise multiple regression procedure, a procedure that was certain to produce findings based on the strength of zero-order correlations between individual predictors and quality of life.

Finally, most of the models tested have explained relatively modest amounts of the variance in quality of life, leading Diener (1984) to conclude that there must be a very large number of factors influencing it. He suggested that it was unrealistic to expect a few variables to explain large amounts of variance in quality of life, and called for more theory-based research using more abstract concepts to explain life quality.

Quality of Life in COPD

As was noted in Chapter 1, health care providers became interested in the concept of life quality when faced with the increased prevalence of chronic illness in an aging population, and the potential of aggressive medical therapies to extend life at a significant cost to quality of life. In the past decade, a number of investigations have been aimed at identifying determinants of life quality in COPD. This research will be reviewed below, with particular emphasis on the relationships among predictor variables and between predictors and quality of life, and on the conceptualization and measurement of quality of life in these studies. In addition, several investigations that did not look explicitly at quality of life but instead described the experiences of people living with COPD will also be discussed because of their importance to development of the theoretical model in the present study.

The experience of living with COPD. Two classic works documented the adjustments people with COPD must make to function effectively in everyday life. Fagerhaugh (1973) described how COPD patients balanced their available supply of time, energy, and money against the demands of daily living. Although she based her notion of the patient's available energy allowance on what is now known to be a faulty rationale (i.e., that people with emphysema lack adequate oxygen to produce energy for activity), Fagerhaugh's (1973) observations of the daily limitations resulting from the disease remain accurate today. She noted that COPD patients, after calculating the resources available to them, set priorities for physical mobility and activity and developed strategies for meeting their needs that involved detailed advanced planning. Her descriptions of how two men with emphysema carefully selected their housing in order to meet their needs for food, medical care, transportation, and socialization vividly illustrated the significant impact the disease had on their lives.

Barstow (1974) explored how COPD affected role performance and how people attempted to cope with the changes imposed by the disease. She noted that for people with chronic illnesses like COPD, the sick role could become a permanent one, especially when a downhill course and diminishing energy forced them to give up work roles and recreational pursuits. Like Fagerhaugh (1973), Barstow (1974) found that people coped with having less energy by planning ahead and by simplifying and pacing activities. COPD affected all areas of life, including the most fundamental activities of daily living and mobility.

Barstow (1974) was unable to establish a relationship between the duration of disease and the extent of disability experienced by individual patients, indicating that other factors besides objective disease characteristics were important determinants of functioning. She identified several factors she believed were influential in patients' abilities to cope with the disease, including the presence of a significant other (which she believed was most important), availability of money and a car, the medical regimen and physician, and possibly "breathing improvement classes" (p. 144).

The two studies described above used qualitative methods to explore the effects of COPD on people's lives. Hanson (1982) used a quantitative approach to identify specific areas of life affected by the disease, and to determine whether disease effects were positive or negative. She asked 128 adults with chronic lung disease to rate the effects of the disease on the following areas: life in general; employment and income; self-care, home responsibilities and personal business; marriage; physical sexual expression; emotional aspects of marriage; care of children or grandchildren; internal emotional factors; and dependency needs. Subjects were also asked to rate the effect of symptoms and the effects of treatments on life in general and on sexuality.

Although the number of subjects responding to items about each area of life varied considerably, Hanson (1982) found that between 74% and 91% of patients rated the effect of COPD on various aspects of their lives as very important. Although the majority (53% to 67%) of patients rated disease effects as negative in most areas, more rated the effects of dependency on others and the effects of treatments as positive than rated them negative (40% positive versus 38% negative, and 53% positive versus 39% negative, respectively). Hanson (1982) viewed those rating the effects as very important and negative to be a critical population whose members may be at risk for special problems. She noted, however, that subjects who were not married, not employed outside the home, whose retirement was a result of lung disease, or who had arthritis were most likely to fall into this critical population, suggesting that factors other than lung disease alone may have influenced the ratings.

In two reports, Kinsman and his colleagues described the results of a study aimed at identifying the symptoms and experiences of people with COPD (Kinsman, Fernandez, Schocket, Dirks, & Covino, 1983; Kinsman, Yaroush, Fernandez, Dirks, Schocket, & Fukuhara, 1983). Subjects first rated the frequency with which they experienced 89 symptoms or sensations during breathing difficulties. These ratings were subjected to cluster analysis, and resulted in ten symptom categories referred to as the Bronchitis-Emphysema Checklist (BESC): helplessness-hopelessness, decathexis, fatigue, poor memory, peripheral-sensory, congestion, sleep disturbance, irritability, anxiety, and alienation (Kinsman, Fernandez, et al., 1983). The most frequently experienced symptoms were dyspnea and fatigue, followed closely by sleep difficulties and congestion. The behavioral responses of irritability, anxiety, decathexis, and helplessness-hopelessness ranked fifth through eighth in frequency (Kinsman, Yaroush, et al., 1983).

When patient subgroups were compared for frequency of symptom occurrence, Kinsman, Yaroush, et al. (1983) found that more women than men reported anxiety, helplessness-hopelessness, and alienation. Patients whose mean age was 52 years (S.D. = 8 years) reported more irritability than patients with mean ages of 64 (S.D. = 2 years) and 72 (S.D. = 3 years). Those in the two younger groups reported more anxiety and alienation than did the oldest group.

Degree of impairment in pulmonary function was not related to symptom ratings except for the fact that the most severely impaired subjects expressed a loss of interest in the routine aspects of life when compared to subjects with normal pulmonary function. Dyspnea increased in frequency with declining self-rated functional status, and subjects with the lowest functional status reported more fatigue, anxiety, and helplessness-hopelessness than did those who were less impaired (Kinsman, Yaroush et al., 1983).

These investigators (Kinsman, Yaroush et al., 1983) noted that the most variance in self-rated functional status was explained when helplessness-hopelessness and PaO_2 (partial pressure of oxygen in arterial blood) were entered in a regression equation, implying that these ratings (if not actual functional status) were affected by the subject's unique perspective in addition to objective disease severity. They concluded that the "classic" symptoms of

COPD "occur within a context of other affective and collateral symptom[s]" (p. 761) that lead to each patient's unique presentation and coping style.

Psychological responses to COPD. In addition to the work described above that sought to describe the effects of COPD on life in general, several investigators have described psychologic responses that are characteristic of the person with COPD. Whether these characteristics were present before COPD became manifest or are a response to living with the disease is unknown. However, the role these psychological characteristics play in the everyday life and care of these patients is undisputed. Their influence on quality of life is of interest in the present investigation, and therefore the relevant research will be reviewed below.

In an early study, Webb and Lawton (1961) compared 33 male COPD patients to 43 men without COPD (both of the former groups drawn from a Veteran's Administration hospital population) and a group of normal Europeans on a measure of personality psychology, the Szondi test. Because of the obvious limitation of comparing American veterans with Hungarians and Spaniards, the comparisons made between them will not be discussed here. However, Webb and Lawton (1961) found some interesting differences between the two groups of veterans. COPD patients had less need to be the recipients of love and affection than the non-COPD patients, but they also tended to express this need less than the other patients. COPD patients had a greater tendency toward self-effacement, concealment, diffidence and unobtrusiveness than the non-COPD patients. However, the two groups were similar on measures of marital status, masculinity, tendency to release aggressive needs (e.g., anger or jealousy), tendency to somatize symptoms, repression of unpleasant conflicts, and loss of ego control.

DeCencio, Leshner, and Leshner (1968) administered the Minnesota Multiphasic Personality Inventory (MMPI) to 43 men (mean age = 59.8 years) hospitalized on a pulmonary rehabilitation unit. These patients scored above the mean for normals on all MMPI subscales except for paranoia; the most significant deviations from normal were found on the depression, hysteria, hypochondriasis, and psychasthenia subscales. Because these authors reported only mean scores, it is not possible to know how many of the subjects were depressed or neurotic. In addition, Dudley, Glaser, Jorgenson, and Logan (1980a) cautioned that elevation in these MMPI subscale scores is normal for older people, and that many items on the subscales reflect somatic symptoms (e.g., fatigue, shortness of breath) known to accompany COPD. Despite these limitations, this study, along with Webb and Lawton's (1961) work, was a beginning step in documenting the personality characteristics commonly associated with COPD.

In pioneering work by Dudley and his colleagues

(Dudley, Verhey, Masuda, Martin, & Holmes, 1969; Dudley, Wermuth, & Hague, 1973), COPD patients were found to use denial, repression, and isolation to limit the experience and impact of psychologic stress. These authors described a sequence of events in which environmental input (e.g., an emotionally-charged event, which could include depression or anxiety [Dudley, Glaser, Jorgenson, & Logan, 1980b]) changed the patient's level of psychologic activation, causing increased ventilation, oxygen consumption, and dyspnea. In order to avoid these noxious physiologic changes, patients donned an "emotional straitjacket", that is, they avoided situations that might have resulted in emotional arousal. A vicious cycle was created when the inadequacy of the defense mechanisms led to increased activation, such as anger, frustration, or despair. Dudley et al. (1969) noted that the cycle might ultimately result in depression, anxiety, or anger, although these were not measured in their study. Thus, anxiety and depression could serve as either the stimulus for or the outcome of this cycle.

Dudley et al. (1969) found that patients' attempts to isolate themselves from environmental input led to difficult interpersonal relationships with friends, relatives, and health care personnel. When defense mechanisms broke down, symptoms increased and the patients deteriorated according to physiologic criteria. Also, patients who were low in psychosocial assets (a vital interest in life, adequate financial resources and housing, social support, ability to adapt to environmental changes required by the illness, congeniality, flexibility, reliability, sense of good judgment and responsibility, freedom from over-sensitivity [Dudley, Glaser, Jorgenson, & Logan, 1980a]) and maximal breathing capacity (MBC) had a poorer prognosis than those high in assets or with a higher MBC. They concluded that psychologic assets were "as important as the physiologic assets in treatment and prognosis of severe airway obstructions [sic]" (Dudley et al., 1969, p. 323).

Agle, Baum, Chester, and Wendt (1973) enrolled 24 men with COPD in a pulmonary rehabilitation program and evaluated the patients' psychological status before treatment and monthly for one year after the program ended. Sixteen patients displayed depressive symptoms in a psychiatric interview conducted at the start of the program. At one-year follow-up, 8 patients were judged to have fewer symptoms, 6 were unchanged, and 2 had worsened symptoms of depression. Of 19 patients judged to be anxious at the start of the program, 10 were improved, 8 were the same, and 1 was worse at the end of one year.

The MMPI was also administered at the beginning and one year after completion of rehabilitation. Patients with the largest increases in physical activity were distinguished from those who improved the least by significant differences on the hypochondriasis, depression, psychasthenia, and social introversion subscales. The authors (Agle et al., 1973) concluded that "successfully rehabilitated patients became more active, less depressed, more outgoing and had a more positive self-image" (p.45) than those who were less successful.

Since only one patient demonstrated significant improvement by physiologic criteria and most remained the same or deteriorated to some extent, Agle et al. (1973) concluded that rehabilitation occurred due to a lessening of psychologic symptoms. Symptom reduction was attributed to the total rehabilitation effort, which operated on the following principles: progressive exercise carried out in the presence of a supportive staff that desensitized patients to dyspnea and fear; education in self-care that fostered a sense of control over symptoms; communication of attitudes by staff that the patient was worth the rehabilitation effort; setting realistic goals that made achievement likely, thus increasing self-esteem; monthly follow-up that reinforced gains; support for efforts communicated by other patients in a group therapy format; internal motivation on the part of patients.

This investigation was limited in a number of important ways, including the use of a small group of volunteers who were motivated to some extent to change, and the absence of a control group. However, these authors (Agle et al., 1973) made several important observations, including the fact that psychologic factors are at least as important as physiologic ones in producing improvements in physical activity during pulmonary rehabilitation. Also, the findings that patients who are to some extent anxious or depressed can have those symptoms relieved by a conscientious rehabilitation program and follow-up, and that fostering autonomy, self-esteem, and social support are possible means for achieving improved physical activity and reduced psychologic symptoms, are important ones.

Additional evidence supporting the interrelationship between psychologic factors and physical function came from a study by Morgan, Peck, Buchanan, and McHardy (1983a). These investigators attempted to predict "disproportionate disability" (i.e., a patient was not able to walk as far as would be predicted by results of a lung function test) from a number of physiologic and psychologic variables (anxiety, depression, and hostility measured with the Multiple Affect Adjective Checklist; psychiatric status measured with the General Health Questionnaire; attitudes and beliefs toward the COPD and its treatment measured with a semantic differential; and pulmonary function and arterial blood-gas measurements). Twenty-four of 50 patients with COPD walked a shorter distance than expected on a 12-minute walk test; the remainder walked farther than expected. The best predictors of disproportionate disability were statements on the semantic differential indicating beliefs about the effects of medical treatment. The only physiologic variable that predicted disproportionate disability was age, with older subjects walking a shorter distance than predicted by lung function. The authors (Morgan et al., 1983a) recommended that both psychologic and physiologic factors should be considered in the assessment of disability.

In a second report drawn from the same research study, Morgan, Peck, Buchanan, & McHardy, 1983b), the investigators attempted to predict the distance walked using the same set of physiologic and psychologic variables as in the report described above (Morgan et al., 1983a). The most important predictor in this equation was the patient's subjective perception of exertion. Other variables that entered the regression equation were statements from the semantic differential that "treatment will cure me", "my bronchitis is bad", "myself as I would like to be--delicate", "my treatment will be successful", and "smoking is awful". One physiologic measure, the forced vital capacity (FVC), entered the equation but accounted for only 4% of the explained variance in walking distance. Again, these authors (Morgan et al., 1983b) concluded that everyday physical function was related more closely to moods, attitudes, and beliefs than to any physiologic variables.

Based on these and the findings of other studies that exercise tolerance correlated poorly with pulmonary function, and reports of a high prevalence of depression and anxiety among COPD patients, Light, Merrill, Despars, Gordon, and Mutalipassi (1985) measured all of these variables in a sample of 45 men with moderate to severe COPD. Using a cut-off score of 15 on the Beck Depression Inventory to indicate the presence of significant depression, they found that 19 (42%) subjects in the sample were depressed. However, only one patient was moderately anxious and five were mildly anxious as measured by the State-Trait Anxiety Inventory; the mean anxiety score for this sample was comparable to that for a general medical population. Despite the fact that only 2% of the sample was anxious, depression and trait anxiety were highly correlated ($r = .81$).

In contrast to the findings of Morgan et al. (1983a, 1983b), Light et al. (1985) found that pulmonary function test results were the best predictors of the distance walked in 12 minutes. In particular, the FEV_1 (forced expiratory volume in the first second of the FVC) explained 15% of the variance in walking distance. In spite of their finding that depression and anxiety did not contribute to the prediction of exercise capacity, the authors speculated that treatment of depression might yield improvement in functional ability.

Finally, in a study that took a different approach to the study of depressed mood in COPD, Labuhn (1984) examined the roles of five socio-demographic and five disease-related variables in predicting depression. She found that perceived illness dysfunction, or the patient's difficulty in carrying out daily physical and psychosocial activities, was most important in predicting depressed mood. Neuropsychological impairment and occupational status also had significant direct effects on depressed mood. Neuropsychological impairment and exercise tolerance had indirect effects on depressed mood through perceived illness dysfunction. Education, age, and disease severity (measured with arterial oxygen saturation) also had indirect effects on perceived illness dysfunction through neuropsychological status. Of special interest was the fact that in mild to moderately severe COPD, psychosocial factors were the most important predictors of depressed mood, but in more advanced disease, physiological and neuropsychological factors became the most important (McSweeny, 1988).

In summary, the work of Dudley and colleagues (Dudley, Verhey et al., 1969; Dudley, Wermuth & Hague, 1973; Dudley et al., 1980a, 1980b) provided considerable evidence for an interrelationship among psychologic characteristics and physiologic symptoms and signs in COPD patients. Indeed, these authors viewed the two categories as interdependent and inseparable. This view was supported by most of the other work reviewed above, with important relationships having been found between functional capacity and attitudes, beliefs, and mood states. Most important, perhaps, is the pervasive finding of significant depression in these samples, and the potential for this mood alteration to disrupt function and life quality in people with COPD.

Investigations into the quality of life in COPD. In the past several years, a number of investigators have examined the life quality of COPD patients. As will be shown below, these studies have used a variety of approaches to conceptualization and measurement of the concept. The specific conceptual and operational definitions used will be mentioned below in the discussion of each individual study, and then summarized at the end of this section.

Brown, Rawlinson, and Hilles (1981), using the approach taken by the early social scientists and gerontologists, attempted to predict life satisfaction in COPD and in coronary artery disease (CAD) with a small number of variables: disability (physician rating of the patient's physical function), self-perceived health, social activity, and locus of control. Life satisfaction was measured with a nine-rung Cantril ladder, an equal-interval scale anchored at either end by the statements "extremely satisfied" and "extremely dissatisfied". They found that, although both patient groups reported moderate life satisfaction, the 32 men with COPD rated their life satisfaction significantly lower than the 51 patients (48 males, 3 females) with CAD. COPD patients also reported less social activity and rated their health lower than did the CAD patients. Physician ratings of disability were higher for COPD patients than for CAD patients. The two groups did not differ on health locus of control, the degree to which they believed they were in control of their own health.

In predicting life satisfaction for the COPD patients alone, social activity was the most important predictor; the only other variable that entered the regression equation was the physician's disability rating. The authors (Brown et al., 1981) speculated that the restricted range of scores on self-perceived health (most subjects rated their health as poor), or the significant correlation between physician and patient health ratings ($r = -.44$) may have prevented the relationship between self-perceived health and life satisfaction from achieving significance. Health locus of control exerted a moderate effect on life satisfaction when the other variables were controlled, but did not achieve significance in the overall regression.

The model explored in this study explained 48% of the variance in life satisfaction in COPD. Judging this to be inadequate, the authors (Brown et al., 1981) suggested that a more complex model might have more explanatory power. Variables suggested for inclusion were demographic variables (although the authors reported non-significant correlations between age, income, or marital status, and life satisfaction in their sample), disease variables (e.g., visibility and constancy of symptoms, stigma, cultural meanings of the disease, prognosis, and typical treatment regimen), and social support.

In a study that represented a departure from most of the work discussed to this point in how it defined and measured quality of life, McSweeny, Grant, Heaton, and Adams (1982) studied 203 patients with severe COPD and hypoxemia who were enrolled in a clinical trial of long-term oxygen therapy (the Nocturnal Oxygen Therapy Trial, or NOTT). These patients were compared to 73 healthy members of a control group matched for age, gender, race, education, and socioeconomic status.

These authors (McSweeny et al., 1982) defined quality of life as having four dimensions: emotional functioning, including mood changes and psychiatric symptoms; social-role functioning, including employment, home management, and social and family relationships; activities of daily living, including self-care ability and mobility; and the ability to engage in enjoyable hobbies or recreation (p. 474). Several instruments were used to measure life quality. The MMPI and Profile of Mood States (POMS) measured emotional functioning. Physical, psychosocial, and overall behavioral functioning were measured with the Sickness Impact Profile (SIP). The Katz Adjustment Scale for Relatives (KAS_r) served as an indicator of social adjustment, recreational behaviors, and general psychological disturbance as perceived by a relative of the subject. Relatives of the controls did not complete the KAS_r.

Consistent with previous findings, the MMPI results in this sample (McSweeny et al., 1982) showed that 42% of the patients were depressed, compared to only 9% of the controls. Fifteen percent of patients had normal MMPI scores, compared to 58% of controls. Abnormal MMPI scores in patients were not associated with demographic characteristics or pulmonary function test results.

Compared to normal controls, COPD patients in this study (McSweeny et al., 1982) were more tense, depressed, fatigued, confused, and lacking in vigor as measured by the POMS. COPD patients were more impaired than controls on all subscales of the SIP, with recreation, home management, and sleep and rest affected the most, and body care and movement, eating, and communication affected the least. Relatives indicated on the KAS_r that they viewed patients as socially withdrawn, somewhat obstreperous, and deficient in role functioning.

McSweeny et al. (1982) entered age, socioeconomic status, global neuropsychological rating, and a severity of disease index in a regression equation to predict quality of life as measured by the SIP overall score. Only the first three variables explained significant proportions of the variance in quality of life, with the total amount of variance explained equal to 25%.

These investigators (McSweeny et al., 1982) noted that although their subjects exhibited a narrow range of disease severity, this variable may not be the most important one for predicting life quality. Rather, disease effects may be mediated by other variables, including physical, neuropsychological, and emotional functioning, ability to fulfill social roles, and others. They suggested that one aspect of pulmonary rehabilitation should be the provision of psychosocial supports in an effort to enhance patients' abilities to cope effectively with COPD.

Prigatano, Wright, and Levin (1984) used many of the same definitions and measures as McSweeny et al. (1982) in exploring life quality in COPD patients with mild hypoxemia. Subjects were 985 COPD patients enrolled in a clinical trial of intermittent positive pressure breathing (IPPB). Also, a representative subset of 100 IPPB trial patients was compared to 25 healthy controls to whom they were matched for age, gender, and education. All subjects completed the same instruments as in the NOTT study (McSweeny et al., 1982), with the following exceptions. Only the subset of 100 completed the MMPI and neuropsychological testing. All patients and controls completed the Recent Life Changes Questionnaire, a measure of stressful life events that might affect quality of life. As in the NOTT study (McSweeny et al., 1982), relatives of the controls did not complete the KAS_r.

Like McSweeny et al. (1982), these authors found that

COPD patients were impaired on all SIP subscales except eating and body care and movement when compared with healthy controls. Patients were also more disturbed than controls on the tension-anxiety, depression-dejection, anger-hostility, fatigue, and vigor subscales of the POMS. Mild disturbances were found on three dimensions of the KAS_r: social obstreperousness, acute psychoticism, and withdrawal-depression. The MMPI profiles obtained in these subjects were similar to those found by DeCencio et al. (1968), but the authors (Prigatano et al., 1984), referring to Dudley et al. (1980a) urged caution in interpreting these findings.

Patients in the IPPB study (Prigatano et al., 1984) did not differ from controls in recent life changes except in the number of health status changes they had experienced in the past year. Patients demonstrated mild impairment in neuropsychological status, particularly in high cerebral problem-solving skills.

Nine variables were regressed against the SIP total score and the SIP psychosocial and physical subscale scores (Prigatano et al., 1984). Fifty-two percent of the variance in the SIP total score was explained, with the POMS tension-anxiety score ($R^2 = .358$), level of exercise ($R^2 = .092$), and education ($R^2 = .037$) accounting for most of the predictive power. The nine variables explained 56% of the variance in the SIP physical score, and 42% of the variance in the SIP psychosocial score, with the POMS tension-anxiety score accounting for most of the explained variance in both subscales (19.2% and 43.3% respectively). Exercise contributed an additional 14.9% of explained variance in the SIP physical score.

Although patients in this study (Prigatano et al., 1984) were not as impaired physically as those in the NOTT study (McSweeny et al., 1982), their psychological profiles were similar. Prigatano et al. (1984) concluded that while disease severity affected physical function, psychosocial limitations must appear with disease onset and remain present despite changes in disease severity.

Of greater interest is the importance of anxiety in predicting the various dimensions of functioning, and the fact that no objective physiologic measure of disease severity had a direct effect on the measure of quality of life. These two findings suggest that psychologic variables may represent a response to COPD or an attempt to cope with the disease, and may be important in predicting life quality of COPD patients (Prigatano et al., 1984).

Traver (1988) sought to identify differences in symptoms and life quality in two groups of COPD patients: those identified as high-emergent (HE) users of the health care system, and a group identified as low-emergent (LE) users. High-emergent users were characterized by one or more of the following: two or more hospitalizations for COPD exacerbation in the past year; two or more emergency room visits in the past year; three or more telephone calls to a primary health care provider in the past month that the provider judged to be inappropriate. Thirty subjects were studied, with equal numbers of men and women in each group. Demographic and pulmonary function test data were obtained from each subject's medical chart. Patients completed the SIP (the indicator for quality of life) and BESC (symptoms), and if available, a spouse completed the KAS_r (n = 17).

No differences were found between HE and LE groups on demographic or disease variables, with the exception that the HE group was significantly younger than the LE group (Traver, 1988). The HE group experienced more frequent dyspnea, irritability, anxiety, decathexis, helplessness-hopelessness, peripheral sensory complaints, and alienation as measured by the BESC. LE subjects were near the population norm on the KAS_r, but HE patients scored significantly higher on the symptom clusters for helplessness, suspiciousness, anxiety, and nervousness.

Both groups had reduced life quality as measured by the SIP, but the HE group was significantly more impaired on the psychosocial subscale than the LE group. HE subjects had higher scores on the emotional behavior and social interaction scales. Using a discriminant function analysis, Traver (1988) found that 80% of patients could be correctly classified as HE or LE using three variables: peripheral sensory complaints and alienation scores from the BESC, and the emotional behavior subscale score from the SIP.

Although Traver (1988) did not set out to describe influences on life quality in COPD, she nevertheless made a contribution to our understanding of the concept. Like McSweeny et al. (1982) and Prigatano et al. (1984), she found significant impairment in function on the SIP in COPD patients. She also demonstrated that although some COPD patients may be anxious, irritable, and inappropriate users of the health care system, not all patients can be characterized in this way. This finding again provides support for the notion that it is not objectively measured disease severity, but more likely is some combination of psychosocial mediators, that determines life quality or functioning in COPD.

Sexton and Munro (1988) compared 72 women with COPD to 40 women without a chronic illness on measures of daily problems experienced, perceived health status, relationship with spouse, subjective stress, and life satisfaction. These authors returned to the earlier, sociological definition of quality of life, using the Life Satisfaction Inventory-A to measure subjective satisfaction with life.

The most common problems cited by COPD women were dyspnea and fatigue, loneliness and depression, and restricted activity. Financial concerns and children were the most frequent problems named by the comparison women; these were the fourth and eighth most frequent concerns, respectively, of the COPD women. There were no differences between the two groups on who the women confided in, although five COPD women (versus no comparison women) said they did not have a confidant. Forty-two COPD women had a spouse; almost half of them said that their illness had brought them closer to their spouses, while 12% indicated it had no effect and 17% felt it had taken them farther apart. Women with COPD rated their overall health and their life satisfaction lower than did the comparison women, and rated subjective stress higher than the healthy women (Sexton & Munro, 1988).

Although no attempt was made to identify relationships among the variables in this study (Sexton & Munro, 1988), the results support earlier findings of reduced life quality in people with COPD. In addition, the most frequent concerns expressed by these women--dyspnea, fatigue, loneliness, and depression--indicate that the effects of COPD are pervasive in everyday life. These effects are not exclusively physiologic ones, as evidenced by the fact that loneliness and depression were the second most frequently-expressed concerns.

Very brief mention will be made here of an Italian study (Dardes et al., 1990), the methods and results of which are difficult to interpret, probably owing to the researchers' difficulty with the English language. These authors defined quality of life with the World Health

Organization (WHO) definition of health, that is, "a state of complete physical, mental and social well being and not merely the absence of disease and infirmity" (WHO, 1947). Unfortunately, the investigators were not specific about the instrument used to measure life quality, although they describe its dimensions as physical function, the ability to engage in social interactions, and psychological status.

These authors (Dardes et al., 1990) found that 41 patients with COPD and chronic respiratory failure were significantly impaired in all three dimensions of quality of life. Patients were found to be unhappy, depressed, tired, and disinterested in their own care, hobbies, and social activities. Impairment on the physical function and psychological dimensions was greater in these COPD patients than in a comparison group of 20 patients with diabetes or atherosclerosis. The two diagnosis groups had similar scores on the social activities dimension.

Caution must be exercised in the interpretation of these results because of the nature of the report. However, the work (Dardes et al., 1990) does have some significance in that it demonstrated that COPD patients outside of the United States also have impaired life quality in comparison to normals and people with other diagnoses. Also of note is the fact that depression, fatigue, and disinterest in life appear to accompany COPD regardless of where it occurs.

A second study from outside the United States was performed in the Netherlands by Schrier, Dekker, Kaptein, and Dijkman (1990). Using the Dutch translation of the SIP and a List of Daily Activities (DAL) to operationalize quality of life, these authors assessed the effects of symptoms and pulmonary function on life quality in 70 patients with chronic non-specific lung disease (CNSLD, which was either asthma or COPD).

Patients in this sample (Schrier et al., 1990) showed significant impairment on the SIP compared to population norms, but this impairment was less than that found in the IPPB (Prigatano et al., 1984) and NOTT (McSweeny et al., 1982) study groups. CNSLD patients were not impaired in as many areas as subjects in the earlier studies, with scores for mobility, body care and movement, social interaction, alertness behavior, and recreation not being significantly different from normals. Dutch CNSLD patients were more likely to require assistance with activities of daily living than were healthy Dutch blood donors.

Chronic cough, wheezing, and dyspnea were related to increased impairment on the SIP, DAL, or both. FEV_1 was the only physiologic measurement associated with the SIP score, although several lung function measures were related to the DAL. Patients with COPD were more impaired than asthmatics on both the SIP and the DAL after controlling for age (Schrier et al., 1990).

These authors (Schrier et al., 1990) were impressed by the poor association between objective physiologic measurements of disease severity and quality of life. Like others before them, they concluded that psychosocial factors must mediate the effects of the disease on life quality.

The last study in this review was reported in two publications (Moody, McCormick & Williams, 1990, 1991), one of which (Moody et al., 1991) reported the correlation matrix among the study variables while the other (Moody et al., 1990) described a path model derived from the data. For the sake of clarity, the two reports will be discussed together.

Moody et al., (1991) proposed a model of quality of life and functional status in COPD that was quite similar to the hypothesized model in the present study. This model suggested that personality factors and symptom severity mediated the relationship between antecedent variables (disease severity, environmental risk, and health care utilization) and outcomes (life quality and functional status). In reality, however, the investigators did not test this model. Instead, they measured the variables in a sample of 45 COPD patients and then sought the path model that explained the most variance in the dependent variables (Moody et al., 1990).

Variables included in the path model were those that had significant zero-order correlations with the outcome variables. (Of interest is the fact that anxiety was not included because of its insignificant correlation with the outcome variables.) The antecedent variables were disease severity (operationalized as FEV_1/FVC ratio) and environmental risk (exposure to tobacco smoke and environmental air quality). Mediating variables were mastery, fatigue, and depression (measured with the Chronic Respiratory Disease Questionnaire, to be discussed later in this chapter), dyspnea severity (measured with a visual analogue scale), and neuroticism (a stable personality characteristic measured with the Neuroticism, Extroversion, Openness Personality Inventory).

Moody et al., (1990, 1991) defined quality of life as an indication of coping effectiveness, and measured it with a five-item scale indicating perceived life quality. Functional status was measured with five subscales of the Arthritis Impact Measurement Scales. The two outcome variables had a correlation of .49, which the authors suggested may have been spurious because the two variables were not related to one another when dyspnea severity was entered into regression equations (Moody et al. 1990).

Disease severity had indirect effects on the outcome variables through mastery and dyspnea severity, and had a direct effect on functional status. Of the two mediators, mastery had a stronger relationship to dyspnea severity than did disease severity, although both relationships were strong. Neuroticism and environmental risk had indirect effects on quality of life through fatigue and depression. Dyspnea severity had direct effects on both outcome variables. Depression was the only other variable with a direct effect on quality of life.

These results (Moody et al., 1990, 1991) suggest that psychological mediators play an important role in patient adaptation to COPD. However, the low subject-to-variable ratio and the failure to test the proposed theoretical model in this study point to the need for further study of the role of mediators in determining quality of life in COPD.

In summary, several investigators have found that people with COPD rate their quality of life lower than do people with other chronic illnesses and those without chronic illness. These findings have been consistent regardless of how life quality has been defined or measured in a given study. Furthermore, a broad spectrum of life domains appear to be affected by COPD, ranging from physical mobility to relationships with significant others.

Less clear from this body of research are the variables that are most important in predicting quality of life in COPD. No two studies have examined the same variables, and even when they have, the findings have been inconsistent. Variables that have been found to predict quality of life in COPD include social activity, physician-rated health (Brown et al., 1981), age, socioeconomic status, neuropsychological impairment (McSweeny et al, 1982), tension or anxiety, level of exercise, education, resting PaO_2 (Prigatano et al., 1984), dyspnea, and wheezing (Schrier et al., 1990). Moody et al. (1990, 1991) were the only investigators to examine the role of variables that might mediate the relationship between objective disease severity and life quality and functional status. They found that the most important predictors of quality of life were indeed mediators: mastery, dyspnea, and depression.

Although the majority of the research related to quality of life in COPD has emphasized the negative consequences of the disease, some investigators have noted that individual responses to COPD and its symptoms may be quite variable. For example, although 38% of Hanson's (1982) subjects rated the effect of COPD upon dependency as negative and important, 40% rated the effect as positive. Increased dependency gave these subjects a pleasant feeling of warmth and security.

McSweeny et al. (1982) and Prigatano et al. (1984) both noted that despite the significant impairment in quality of life reported by their subjects as a group, there was considerable variability among them as individuals. Traver (1988) found that although HE and LE subjects were similar on measures of pulmonary function, oxygen use, somatic symptoms (except for dyspnea frequency), physical function, and role function, the two groups differed significantly on psychological symptoms such as anxiety, nervousness, helplessness, and suspiciousness.

Based on these and other findings, McSweeny (1988) suggested that psychological factors and coping ability should be studied as potential mediators of patient responses to COPD. As was discussed earlier, Moody et al. (1990, 1991) tested a path model that included mediating variables. Although this study represented an important step forward in describing the determinants of quality of life in COPD, it was limited by its small sample size and its failure to use a theoretical framework to guide the selection of variables and their placement in the model.

The present investigation seeks to address these limitations. However, before describing the design of the present study in detail, two additional aspects of the literature related to COPD need to be addressed. First, four studies that examined several of the variables of interest to the present study but in which quality of life was not the dependent variable, will be described. Second, the issue of how to measure quality of life in COPD will be discussed.

<u>Other important studies</u>. Jensen (1983) sought to identify factors related to hospitalization in COPD patients, particularly in what he called "high-risk" patients, that is, those who had high stress (measured with the Schedule of Recent Experience; SRE) and low social support (measured with the Social Assets Scale; SAS).

Thirty-one high-risk patients were divided into three subgroups: one group was assigned to a pulmonary rehabilitation group, one to a pulmonary self-help support club, and the third to a wait-list control condition. In the six-month treatment period, significantly more control than treatment subjects were hospitalized, and hospital stays for controls were significantly longer. Severity of illness, number of previous hospitalizations, and SAS score did not predict hospitalization.

Predictors of hospitalization for 38 untreated high- and low-risk (i.e., low stress and high social assets) subjects were also examined using discriminant function analysis. SAS and SRE scores discriminated between hospitalized and non-hospitalized patients, with 32 patients being correctly classified by the analysis. Age, gender, and severity of illness did not discriminate between the two groups, while the number of previous hospitalizations discriminated minimally. In a subgroup of severely ill patients, the SAS was the most powerful predictor of hospitalization (Jensen, 1983).

Like the studies reviewed earlier that sought to explain quality of life in COPD, this study (Jensen, 1983) found that psychosocial variables were the most important predictors of hospitalization in COPD patients. Of particular interest is the fact that social assets were the most important predictor of hospitalization in patients with severe COPD. In addition, patients who took part in either of the two treatment groups had fewer and shorter hospitalizations than did high-risk controls, leading Jensen (1983) to hypothesize that both treatments exerted their effects by increasing patients' social support. This study suggests that social support may be an important determinant of patients' responses to COPD.

Leidy (1990) examined the effects of psychosocial attributes, basic need satisfaction, perceived stress, and disease severity on symptomatic experience in long term chronic illness in 109 COPD patients. She found that basic need satisfaction was inversely related to symptomatic experience, having both a direct effect and an indirect effect through perceived stress. However, the direct effect in females was not statistically significant. Psychosocial attributes had a positive direct effect on symptomatic experience in males, but had a negative effect in females. Disease severity had no effect on symptomatic experience in either gender.

Unlike previous investigations, Leidy (1990) found significant differences between males and females in the response to COPD; 39% of the variance in symptomatic experience was explained by gender. Consistent with earlier findings, objectively-measured disease severity had no effect on symptomatic experience, while psychosocial attributes were a more important determinant of patients' experiences in living with COPD.

Using a stress and coping framework (Lazarus & Folkman, 1984), Lee, Graydon, and Ross (1991) examined the role of psychological well-being, physical status, and social support in predicting functional status in oxygen-dependent COPD patients. Thirty subjects with severe COPD completed the POMS (psychological well-being), BESC (physical status), Personal Resource Questionnaire (social support), and SIP (functioning). A second indicator of physical status was the $FEV_1\%$ (i.e., the patient's FEV_1 compared to that predicted for him or her based on age, gender, and height).

The best predictors of functioning were objective and subjective indicators of disease severity, that is, $FEV_1\%$ and BESC. In particular, dyspnea was the most important symptom in predicting functioning. Psychological well-being did not enter the regression equation, probably because of its moderately high correlation with symptoms ($r = .58$).

Of interest is the fact that self-reported symptoms did not correlate with $FEV_1\%$ ($r = -.07$). However, the range of FEV_1 in this study (Lee et al., 1991) was restricted to less than 40% of predicted, which may have attenuated the correlation. An alternative explanation for this finding is that psychological factors mediate the effect of objective disease severity on functioning, but this possibility was not tested in this study. Also of interest is the fact that social support had moderately strong zero-order correlations with psychological status (r = -.51) and functioning (r = -.42). The possible effect of social support on functioning may have been obscured by the relatively high correlations among the study variables.

Finally, Weaver and Narsavage (1992) studied the effects of pulmonary function, exercise capacity, depression, self-esteem, and causal attributions on functional status in 104 subjects with COPD. Functional status was measured in this study by an investigator-developed instrument, the Pulmonary Functional Status Scale (PFSS). This instrument contains items related to demographic characteristics, ability to complete activities of daily living, relationships, dyspnea, anxiety, and depression.

Weaver and Narsavage (1992) found moderately high correlations between functional status and exercise capacity (r = .67), self-esteem (r = .41), and depression (r = -.40). In contrast, the correlation between pulmonary function (FEV_1/FVC%) and functional status was modest (r = .29). In a stepwise regression analysis, the variables accounting for the most variance in functional status were exercise capacity and depressed mood. This finding should not be surprising given the high zero-order correlation between function and exercise capacity. The relative importance of depression did not change when the items on the PFSS pertaining to anxiety and depression were deleted from the analysis.

Although the four studies discussed in this section (Jensen, 1983; Leidy, 1990; Lee et al., 1991; Weaver & Narsavage, 1992) examined a variety of dependent variables, each one sought to explain a response to living with COPD. They confirmed the influence of psychosocial variables such as depression, social support, causal attribution, and basic need satisfaction on coping with this chronic illness. They also establish or confirm the relationships among a number of variables of interest in the present study. These relationships will be discussed further in the second part of this chapter.

<u>Approaches to measurement of quality of life in COPD</u>. From the literature reviewed to this point, it is clear that a variety of approaches have been used to conceptualize and measure quality of life in COPD. The most common approach has been that of McSweeny et al. (1982), Prigatano et al. (1984), Traver (1988), and Schrier et al., (1990) all of whom defined quality of life in terms of functioning in the physical and psychosocial realms. All of these investigations operationalized functioning with the Sickness Impact Profile (SIP), a measure of sickness-related dysfunction in three domains: physical, psychosocial, and independent (Bergner, Bobbitt, Pollard, Martin, & Gilson, 1976; Bergner, Bobbitt, Carter, & Gilson, 1981).

In contrast, Brown et al. (1981) and Sexton and Munro

(1988) defined life quality as the individual's subjective satisfaction with life. The single-item Cantril ladder used by Brown et al. (1981) was a measure of global life satisfaction, while the Life Satisfaction Inventory-A measured five components of life satisfaction: zest; resolution and fortitude; congruence between desired and achieved goals; positive self-concept; and mood tone (Wood, Wylie, & Sheafor, 1969).

Moody et al. (1990, 1991) measured self-perceived life quality using a five-item scale developed originally for use with cancer patients. The Quality of Life Index measures satisfaction in five domains: activity, daily living, health, social support, and outlook on life (Spitzer et al., 1981).

Kaplan, Atkins, and Timms (1984) used the Quality of Well-Being Scale (QWB) to assess responses to behavior modification interventions in COPD patients. This scale, part of a broader Health Status Index, was designed for at least two reasons: "to express diminished quality of life attributable to illness or disability" (p. 89), regardless of the type of illness; and to serve as a measure of cost-effectiveness of interventions across a variety of disease groups. Since the QWB is not a COPD-specific scale, it allows comparisons of life quality across chronic illnesses.

Items in the Health Status Index relate to function (e.g., physical and social activity, mobility) and symptoms or problems that produce dysfunction. The QWB score can be mathematically reduced to a measure of well-years, or the number of years of life produced or saved by an intervention. Therefore, this instrument has the potential for use in policy development as well as in evaluating responses to clinical interventions.

In contrast to the general approach to quality of life measurement taken by the authors of the QWB (Kaplan, Atkins, & Timms, 1984), Guyatt and his colleagues (Guyatt, Bombardier, & Tugwell, 1986; Guyatt, Berman, Townsend, Pugsley, & Chambers, 1987; Guyatt, Townsend, Berman, & Pugsley, 1987) have argued for a disease-specific approach. These workers developed items for the Chronic Respiratory Disease Questionnaire from interviews with COPD patients, consultation with pulmonary nurse specialists, review of the literature and other quality of life instruments, and clinical experience. Four dimensions of life quality were included in the final scale: dyspnea, mastery, fatigue, and emotional function (embarrassment, depression, anxiety, and frustration; Guyatt, Townsend, et al., 1987).

A useful role probably exists for each of these approaches to measurement of life quality in COPD. Instruments that measure function, such as the SIP and the QWB, may be the most appropriate when interventions aimed specifically at function are planned. Disease-specific, or indeed symptom-specific, measures are likely to be the most sensitive when the goal of intervention is to reduce symptoms.

The conceptual difficulty with these approaches is that, although function and symptoms may influence quality of life, they do not represent the concept of quality of life as it has been defined here, that is, the subjective perception of life satisfaction across many life domains. What they do represent are important outcomes of interventions aimed at improving the physical and psychosocial functioning of the COPD patient. The present investigation hypothesizes that aspects of physical and psychosocial function, in turn, will have direct or indirect effects on the patient's subjective evaluation of his or her quality of life.

Quality of Life in Other Chronic Illnesses

As has been stated previously, the purpose of the present investigation was to test a model of quality of life in one chronic illness, COPD. It should be noted that researchers have investigated quality of life in many other chronic illnesses, including chronic renal failure (Laborde & Powers, 1980) cancer (Lewis, 1982; Padilla & Grant, 1985), sudden cardiac death (Underhill, 1992), and arthritis (Burckhardt, 1985; Laborde & Powers, 1985). The literature related to these investigations will not be reviewed here, with the exception of Burckhardt's (1985) study of quality of life in arthritis. The influence of this study on the design of the present investigation will become clear in the remainder of this chapter.

Burckhardt (1985) proposed a theoretical model to explain quality of life in people with arthritis. Using Lazarus' early work as a framework, she hypothesized that the effects of environmental inputs (age, gender, severity of pain, severity of impairment, socioeconomic status, and social network configuration) on quality of life would be mediated by psychological factors (perceived social support, negative attitude toward the illness, self-esteem, and internal locus of control for health). Specifically, she hypothesized that the psychological mediators would be the only variables having direct effects on quality of life.

Ninety-four arthritis patients were interviewed. The results confirmed Burckhardt's (1985) major hypothesis that only the psychological mediators would have direct effects on quality of life. A total of 46% of the variance in quality of life was explained, with self-esteem accounting for 25% of the explained variance. Internal control over health, negative attitude toward the illness, and perceived support accounted for 20%, 15%, and 10% of the explained variance, respectively. One input variable, severity of impairment, had a significant though indirect effect on quality of life.

Implications for COPD and other chronic illnesses. These findings represented beginning evidence that the cognitive theory of stress and coping could be useful in explaining the impact of chronic illness on quality of life (Burckhardt, 1985, p. 18). For this reason, and also because the stress and coping framework was congruent with the clinical observations made by the present investigator, it was chosen as the theoretical framework for the present study. This study therefore represented an opportunity to replicate and extend Burckhardt's (1985) findings in a sample drawn from a different chronic disease population.

Theoretical Framework

This second chapter section will first discuss the cognitive theory of stress and coping as proposed by Lazarus and Folkman (1984) that serves as the framework for the present study. Then, the hypothesized causal model to be tested in this study will be described, and the variables and the proposed relationships among them will be discussed.

Stress, Coping, and Adaptation

Lazarus and Folkman (1984) defined stress as a relationship between a person and the environment that is appraised by the person as taxing or exceeding available resources and potentially threatening to well-being. In this conceptualization, it is not the events or environmental conditions themselves that are stressful; rather, it is the interaction between the event and a susceptible host that constitutes a stressful encounter. When confronted with a potentially stressful situation, the person determines whether and how it is relevant to well-being (is it benign, challenging, threatening, or potentially harmful?) and what, if anything, can be done to prevent harm or maximize the chances for benefit. The first determination (is it relevant?) constitutes primary appraisal, and the second (what can be done?) is the process of secondary appraisal.

Two types of factors can influence the person's appraisal of a situation: person factors and situation factors. Person factors include commitments, which determine what is at stake in a particular encounter because they represent what is important to or has meaning for the person. Beliefs, another type of person factor, are pre-existing notions people have that determine how they perceive the reality of a situation. Important beliefs are those relating to personal control over a situation, and existential beliefs, such as faith in God, fate, or a natural order in the universe (Lazarus & Folkman, 1984, p. 77).

Situation factors influencing the appraisal of an encounter include the novelty and predictability of the situation, event uncertainty (the person's estimate of the likelihood of an event's occurrence), event timing, duration, and uncertainty as to when the event will occur.

Because it is not possible for people to know all, or perhaps any of these factors, ambiguity related to them is also an important situation factor.

Coping is defined as the individual's "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding [the person's] resources" (Lazarus & Folkman, 1984, p. 141). How people actually cope depends in part upon available resources and constraints that limit use of these resources. Among the resources that influence coping are health and energy, positive beliefs about the self, problem-solving skills, social skills, social support, and material resources. Internalized cultural beliefs, competing demands for resources, and a high level of potential threat are some of the many possible constraints upon coping efforts.

Coping outcomes reflect adaptation in the areas of social functioning, morale (well-being or life satisfaction), and somatic health. While the discussion so far has emphasized the specific stressful encounter, outcomes may be viewed as both the short-term effect of coping in a specific encounter and as long-term outcomes in these three broad areas. Long-term adaptation is seen as parallel to and an extension of the outcomes that result from individual stressful encounters (Lazarus & Folkman, 1984).

The Hypothesized Model of Quality of Life in COPD

In this study, it was hypothesized that the influence of environmental events or demands on life quality would be mediated by psychological responses frequently associated with the illness and by coping resources available to the COPD patient. Two categories of environmental antecedent variables were included in the model: demographic (age and socioeconomic status), and disease (objective disease severity, dyspnea, and functional status). The mediating variables were two sets of intrapersonal factors: available psychological resources (self-esteem, dispositional optimism, and social support), and psychological responses frequently associated with COPD (anxiety and depression). The indicator of adaptation was subjectively perceived quality of life.

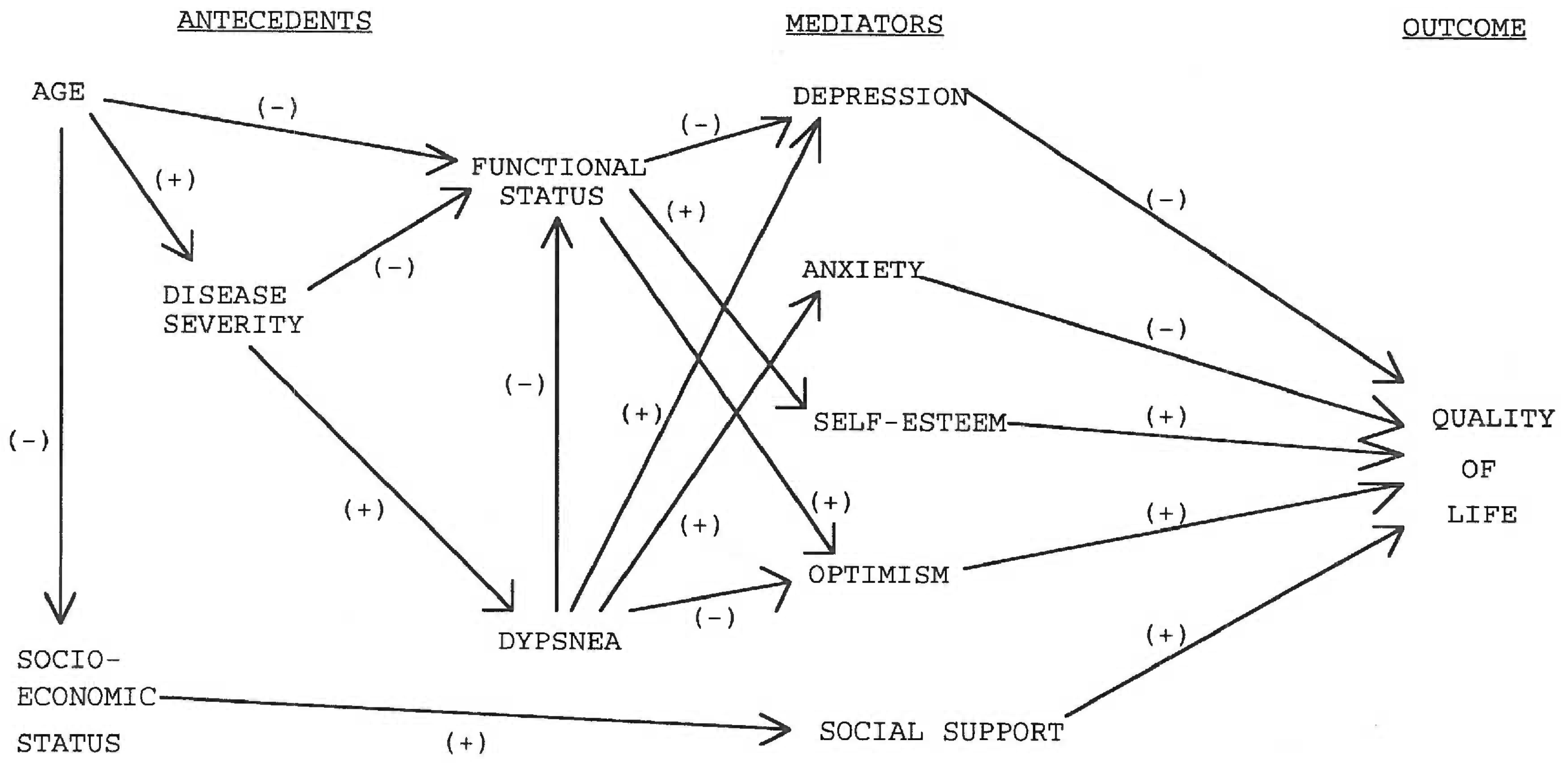
The proposed model of quality of life in COPD is shown in Figure 2-1. Hypothesized directional relationships among the variables are represented in the model by single-headed arrows; negative and positive relationships are represented by minus (-) and plus (+) signs, respectively. Only relationships supported by the literature relating to the variables, or by the stress and coping framework, are shown in Figure 2-1.

Variable Selection and Placement in the Model

Variables were selected for the model based on the findings of previous research, Lazarus and Folkman's (1984)

FIGURE 2-1

HYPOTHESIZED MODEL OF
QUALITY OF LIFE IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE



proposals for variables thought to be important in stress and coping, and the investigator's clinical experience. Empirical evidence and the conceptual rationale supporting inclusion of each variable, and for its hypothesized relationships with other variables, will be given below. The conceptual definition for each variable will also be given in this chapter. The operational definitions will be discussed in Chapter 3.

<u>Demographic variables: age and socioeconomic status</u>. McSweeny et al. (1982) found that age was an important predictor of quality of life in their sample of severely ill COPD patients. Investigators in the IPPB study (Prigatano et al., 1984) of less severely ill patients found that physical function scores, one component of their definition of life quality, declined with increasing age.

Since both McSweeny et al. (1982) and Prigatano et al. (1984) used a measure of functional status as the empirical indicator of quality of life, and both found significant relationships between age and at least some components of functional status, age was included in the proposed model as a predictor of functional status. An increase in disease severity was also hypothesized to accompany increasing age, since a known amount of pulmonary function is lost each year in all people, including normals (Murray, 1986). Finally, older age was linked to lower socioeconomic status based on the findings of Burckhardt (1985), and by data published by the United States General Accounting Office (GAO; 1992) documenting a higher prevalence of poverty in older age groups.

Socioeconomic status was defined in this study as the position a person occupies in the status structure of society. Like age, socioeconomic status was an important predictor of quality of life in the study by McSweeny et al. (1982). Prigatano et al. (1984) found that a component of socioeconomic status, educational level, had a positive relationship with SIP physical and psychosocial function, and when entered in a regression equation was an important predictor of the SIP total score.

Two studies by gerontologists also suggested that there was a relationship between socioeconomic status and life quality. Edwards and Klemmack (1973) and Palmore and Luikart (1972) found that higher socioeconomic status was associated with higher life satisfaction among older people. However, Palmore and Luikart (1972) noted that this relationship was strongest among lower income groups, and that once income reached an average level, the variable was less important in predicting life quality.

In the present study, socioeconomic status was hypothesized to have an indirect effect on quality of life, that is, it was viewed as an antecedent rather than a mediating variable. This hypothesis differs somewhat from Lazarus and Folkman’s (1984) suggestion that material resources serve as coping resources that can be used to purchase the goods or services needed to cope with a stressful transaction. However, an alternative view is that socioeconomic resources are an objective variable whose adequacy is judged by the viewer through a lens of psychological characteristics and perceived needs. The ability to make effective use of those resources in a stressful encounter may depend on the availability of other coping resources. A second reason to categorize socioeconomic status as an antecedent variable is that of temporal ordering of events. Because most of the study participants were expected to be older, retired people whose socioeconomic circumstances were unlikely to change, placement of the variable early in the model was indicated from the perspective of a logical time sequence of events.

In their model of social support and adaptation, Dimond and Jones (1983) proposed that environmental resources, including sociocultural components such as socioeconomic resources, norms, values, and beliefs, influenced the effects of an individual's social support network, the type of support offered, and the perceived adequacy of the support (p. 246). Hence, socioeconomic status was hypothesized to have a positive effect on social support in the quality of life model proposed in this study. That is, people with more material resources would be expected to have higher levels of perceived support.

Disease variables: disease severity, functional status, and dyspnea. This investigation grew out of the clinical observation that despite objective similarities in disease severity, there was considerable variability in how people with COPD lived their lives. Therefore, it was essential that a measure of disease severity be included in the proposed model. Because reduced expiratory air flow is the defining characteristic of COPD (ATS, 1987b), disease severity was defined in this study as the degree of impairment in the subject's expiratory flow rates, and specifically, the FEV_1%. The FEV_1 is the forced expiratory volume in the first one second of the forced vital capacity, or in lay terms, the amount of air exhaled in the first one second of a maximum exhalation following a maximum inhalation. The FEV_1% is the patient's actual FEV_1 compared to what would be predicted for him or her based on age, height, and gender.

Prigatano et al. (1984) found a significant correlation between FEV_1 and SIP scores, although FEV_1 was not an important predictor of the SIP total score when entered into a regression equation. Moody et al. (1990) found that disease severity had a direct negative effect on functional status, as well as an indirect effect through mastery and dyspnea. In the severely ill patients studied by Lee et al. (1991), disease severity explained 13% of the variance in SIP scores. Therefore, the quality of life model hypothesized that an increase in disease severity would be associated with a reduction in functional status.

The model tested in this study predicted a relationship between increasing dyspnea and decreasing functional status. Mahler and Wells (1988) studied the psychometric characteristics of three instruments for measuring dyspnea. In their study, FEV_1 correlated significantly with the Modified Medical Research Council Dyspnea Scale ($r = -.42$), the Baseline Dyspnea Index ($r = .43$), and the Oxygen Cost Diagram ($r = .16$; differences in sign are due to differences in the direction of scaling, that is, whether zero represents no dyspnea or worst dyspnea). Increased disease severity as measured by FEV_1 and FVC was associated with increased dyspnea in the study by Guyatt, Townsend, et al. (1987), although the amount of variance accounted for was small. FEV_1 and symptom experience were significantly related to one another by statistical, but not clinical criteria in Leidy's (1990) study. Although the relationship between disease severity and dyspnea has been modest or insignificant in some studies, the potential clinical importance of this relationship argued for its inclusion in the proposed model.

Perhaps the most frequently measured variable in clinical research related to COPD has been functional status. As noted earlier, many studies have defined quality of life in terms of functional status, although the definition has usually included psychosocial or emotional function in addition to physical function. Moody et al. (1990), Lee et al. (1991), and Weaver and Narsavage (1992) all studied functional status as an outcome variable in its own right, attesting to its importance. In the present study, functional status was defined in terms of the physical dimension only, and was the patient's level of ability to perform important daily activities (Moinpour, McCorkle, & Saunders, 1988).

In contrast to most of the research described earlier, functional status was an antecedent, rather than an outcome variable, in this investigation. This decision was based on two studies conducted by nurses, as well as the cognitive theory of stress and coping. First, Labuhn (1984) found that exercise tolerance predicted depressed mood indirectly through physical and psychosocial functioning. Burckhardt (1985), citing the temporal ordering of events, categorized physical impairment in arthritis as an input variable. Her data supported this hypothesis.

Lazarus and Folkman (1984) described situation characteristics that influenced the individual's appraisal of the situation as potentially harmful or threatening. Among these were the duration and ambiguity of the situation. An impairment in physical functioning and the ability to perform essential activities of daily living is of long duration in a chronic, progressive illness like

COPD. How people respond to the situation of chronic physical impairment depends in part on the coping resources (i.e., mediators) available to them.

The situation in COPD produces ambiguity in that patients never know from day to day what level of function they will be capable of. On some days a patient may be able to accomplish all daily activities independently, but on others will require assistance or will choose not to perform certain activities due to fatigue or dyspnea. According to Lazarus and Folkman (1984), the greater the ambiguity in a situation, the greater the involvement of factors such as personality dispositions in determining the meaning of the situation. Therefore, in the model of life quality in COPD, the personality factors are shown as mediators of the ambiguous, and potentially threatening, situation associated with impaired function in COPD.

Dyspnea is the subjective experience of difficult breathing, and includes both the perception of difficult breathing (perceived effort or intensity) and the person's response to the sensation (Carrieri, Janson-Bjerklie, & Jacobs, 1984). Dyspnea is the primary symptom in COPD (Harver & Mahler, 1990), and therefore was included in the hypothesized quality of life model.

Based on the findings of numerous investigators described earlier, the model hypothesized that dyspnea has a negative effect on functional status. Patients studied by

Guyatt, Townsend, et al. (1987) rated dyspnea as the symptom that occurred most frequently and that had the greatest impact on their daily lives. Schrier et al. (1990) and Lee et al. (1991) found that dyspnea was the most important predictor of functioning in their mildly and severely ill samples, respectively. Dyspnea had a significant direct effect on functional status, and was the most important predictor of functional status in the study by Moody et al. (1990).

Anxiety, hopelessness-helplessness, and decathexis were associated most frequently with the symptoms of dyspnea and fatigue in the work of Kinsman, Yaroush, et al. (1983). Like functional status, dyspnea is a symptom of long duration and is likely to produce significant ambiguity in that its severity varies daily (or hourly). Dyspnea also represents a potentially harmful or threatening situation to the patient that must be dealt with using the coping resources within his or her reach. Therefore, dyspnea is shown in the hypothesized model as an antecedent to the mediating variables.

<u>Mediating variables: anxiety, depression, self-esteem, optimism, and social support</u>. As was related earlier in this chapter, depression and anxiety have repeatedly been demonstrated to be common psychological concomitants to COPD (Agle et al., 1973; Dardes et al., 1990; Dudley, Glaser, et al., 1980b; Light et al., 1985; McSweeny, et al., 1982;

Prigatano et al., 1984). Scores on the tension-anxiety subscale of the POMS were the best predictor of quality of life in the IPPB study (Prigatano et al., 1984). Moody et al., (1990) found that depression had a direct effect on quality of life, and was an intervening variable between two predictors, neuroticism and environmental risk, and quality of life.

Based on this body of work, anxiety and depression were important variables to include in the quality of life model. In this study, anxiety was defined as a condition characterized by unrealistic or excessive apprehension or worry about more than two normal life circumstances that is present for most days over a 6-month period (American Psychiatric Association [APA], 1987). Depression was defined as depressed mood or loss of interest or pleasure for most days over a 2-week period, accompanied by at least four of the following symptoms: change in weight or appetite; change in sleep pattern, usually insomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness or guilt; inability to concentrate or make decisions; recurrent thoughts of death with or without suicidal ideation (APA, 1987).

Although inclusion of these two variables was clearly important based on previous findings, their placement in the model as mediators, rather than outcomes, must be addressed. In contrast to Lazarus and Folkman's (1984) emphasis on coping resources as something that one draws upon when appraising a potentially threatening situation, these mood states would appear to be evidence of failure to adapt to the challenges posed by chronic illness. However, although depression and anxiety cannot be considered coping resources, they can be viewed as person characteristics used in appraisal of potential harm or threat in the situation. Alternatively, they can also be viewed as personal constraints upon the use of coping resources, since both mood states might interfere with positive beliefs about the self or effective utilization of available social and material resources. Their placement in the model as mediators makes sense from both of these perspectives.

Self-concept is a person's perception of him- or herself in the physical, intellectual, moral-ethical, emotional, and social domains. Self-esteem is the evaluative or affective component of the self-concept; whereas self-concept is how the person sees himself, self-esteem is how the person feels about himself (Kersten, 1990; Taft, 1985). Self-esteem is the variable of interest in this study for the reasons described below.

In his review of research on subjective well-being, Diener (1984) noted that self-esteem was one of two variables that was consistently related to quality of life. Burckhardt's (1985) study reaffirmed these earlier results, finding that self-esteem was the most important predictor of quality of life in arthritis patients. Finally, Lazarus and Folkman (1984) identify positive beliefs about the self as an important psychological resource for coping with threatening situations.

Dispositional optimism is an enduring personality trait reflecting people's generalized expectancies that good things (as opposed to bad) will happen to them (Scheier & Carver, 1985, 1987). Such positive outcome expectancies lead people to view desired outcomes as attainable, and thus to persist in efforts to achieve them. When an outcome is not viewed as attainable, the individual is likely to reduce efforts aimed at goal achievement, and ultimately, to withdraw from the attempt (Scheier & Carver, 1987).

As a concept, dispositional optimism has been developed relatively recently, and its inclusion as a variable in studies of chronic illness has been limited. However, it is an attractive concept in that it addresses generalized expectancies for favorable outcomes, compared to other concepts such as self-efficacy or locus of control, which are thought to change depending on the specific situation the person is confronted with. Since this study addressed the whole of life in its many dimensions, an indicator of general outlook on life was most appropriate.

In one study that did examine the relationship between optimism and quality of life, Scheier and Carver (1987) found that pre-operative optimism was significantly correlated with post-operative self-reported life quality (r = .57). Therefore, a positive relationship between the two variables was hypothesized in this study.

Scheier and Carver (1987) found that self-reports of symptoms did not predict optimism in a study of college students during a high-stress time, that is, the last four weeks of a semester. However, it is difficult to make hypotheses about chronically ill older people based on these data alone. Based on Lazarus and Folkman's (1984) discussion of situation factors in appraisal (e.g., duration and ambiguity), dyspnea and functional status were thought to be important influences on outlook. Therefore, this study hypothesized that higher levels of dyspnea and lower levels of functioning would be associated with lowered dispositional optimism.

Resources such as emotional, instrumental, and informational assistance provided by other people that may have positive or negative effects on health and well-being constitute social support (Cohen & Syme, 1985). Although social support is sometimes characterized by its structure (i.e., its size and interconnectedness), it is the individual's perception of the adequacy of support that is related to its effect on adaptation (Cohen & Wills, 1985).

Psychosocial assets, including social support, have been related to prognosis in COPD (Dudley et al., 1969), and to fewer hospitalizations and higher activity scores

(Jensen, 1983). Although social support and function had significant zero-order correlations in their study of severely ill COPD patients, Lee et al. (1991) did not find social support to be an important predictor of function when entered into a regression equation. The weight of evidence, however, is in favor of the idea that social support plays an important role in the lives of COPD patients, arguing for its inclusion in the quality of life model.

Lazarus and Folkman (1984) identified social support as an important coping resource in determining how individuals appraise their ability to deal with a potentially harmful or threatening situation. Burckhardt (1985) found that perceived social support was one of four psychosocial mediators that predicted quality of life in arthritis. Therefore, perceived social support was hypothesized to be a mediating variable in the present study.

<u>Outcome variable: quality of life</u>. The importance of quality of life as an outcome variable in chronic illness and advanced age was discussed at length earlier in this chapter. Following that discussion, a definition of quality of life was proposed that was quite similar to that derived by Oleson (1990), that is, quality of life is the subjective perception of satisfaction with life in domains of importance to the individual. The domains to be operationalized in this study are those proposed by Flanagan (1978) and Burckhardt et al. (1989): physical and material

well-being; relations with other people; social, community, and civic activities; personal development and fulfillment; recreation; and independence.

Summary

The first part of this chapter reviewed the literature in several areas. First, a conceptualization of quality of life was developed from the early social science literature on the topic. Second, the literature related to life quality in older people was summarized. Third, the literature related to the psychosocial accompaniments to COPD was described, followed by a review of the literature on quality of life in this particular chronic illness.

The second part of the chapter presented the theoretical framework for the study, and described how variables were selected for study. Variable placement in the model and the related hypotheses were also discussed.

In the next chapter, the study design and methods used to test the model will be described.

CHAPTER 3

Method

Design

Because the research question sought to explain the relationships among several variables that might predict quality of life in COPD, a correlational survey design was selected. Data were collected on a single occasion from a sample of people with COPD. Sample selection is described below.

Setting and Sample

A convenience sample of 134 patients with COPD was recruited from a large private practice in Tacoma, Washington. The practice consisted of six physician pulmonary specialists and one nurse practitioner with expertise in pulmonary care. At the time of data collection, it was the only pulmonary specialty practice in Tacoma, so that the clinic population represented the entire population of COPD patients in the metropolitan area and surrounding rural communities who were followed by a private pulmonary specialist.

Sample Recruitment

Prospective subjects were identified in two ways. The large majority of potential subjects were identified by a review of patient appointments scheduled for 3 weeks from the current date. All of the patient charts for the day in question were then reviewed to determine whether they met criteria for inclusion in the study (see below). Patients who met the criteria were sent a letter introducing the study and inviting them to participate (Appendix). Demographic and disease data were recorded on the Chart Data Screening Form and page 4 of the Descriptive Data sheet (Appendix).

Those willing to participate based on the Letter of Introduction returned a postcard to the investigator indicating that they could be contacted by telephone. The investigator then called the patient and described the study in more detail (Appendix). If the chart review had left it unclear as to whether the patient met all of the inclusion criteria (for example, whether the subject had functional limitations other than COPD), eligibility was clarified by asking whether the patient was limited in performance of daily activities by anything other than breathing. If the patient named another condition, the investigator then sought to determine the extent of the limitation and whether breathing or the other problem was the more limiting factor.

When the investigator was satisfied that all inclusion criteria were met and the patient agreed to participate, an appointment was made for an interview either immediately before or after the scheduled physician visit. The patient was asked to bring any prescribed inhaled bronchodilators and, if oxygen was prescribed for use with activity, a portable oxygen tank, to the interview.

Once data collection began and the investigator was present in the clinic several days a week, subject recruitment expanded to include those patients who had called and made appointments after the investigator had reviewed the schedules 3 weeks earlier. Charts for these patients were reviewed for eligibility criteria. If the patient met the criteria, a note was placed on the front of the chart requesting that the physician briefly introduce the study to the patient and ask if the investigator could speak with him or her about it. If the subject was willing to talk with the investigator, the study was described in the same way as in the telephone calls described above. Interviews were then scheduled with patients who were willing to participate at a time that was convenient for them. Some subjects completed the study the same day, while a few returned to the clinic on another day when they had more free time.

Inclusion and Exclusion Criteria

Patients were eligible for the study if they were at least 40 years of age, spoke English, were without advanced cognitive impairment, and had a medical diagnosis of COPD, chronic bronchitis, or emphysema with an FEV_1 less than or equal to 70% of predicted. Results of simple spirometry (FEV_1 and FVC) must have been recorded while the patient was in a stable condition during the previous 12 months. If spirometry had not been recorded within the preceding 12 months but the other criteria were met, the patient was invited to participate and spirometry was scheduled to be performed at the time of the interview.

Cognitive impairment was assessed in two ways. First, if the patient's clinic chart listed a diagnosis such as dementia, organic brain syndrome, or developmental disability, the patient was not sent a Letter of Introduction or approached in the office. Second, the Mini-Mental State Examination (MMSE) was administered to all participants. Subjects who scored less than 23 on the MMSE were not included in the data analysis. (The MMSE is described later in this chapter in the section on instrumentation.)

Patients were excluded from the study if they had had an acute exacerbation of COPD or had been hospitalized for lung disease within the 3 weeks preceding the appointment. However, acutely ill patients who indicated willingness to participate at the time of the telephone call were scheduled for an interview after the 3-week stabilization period had passed. Patients were excluded if they had a medical diagnosis or condition other than COPD that limited functional ability, such as arthritis with limitation of joint range of motion, cardiac disease with dyspnea, fatigue, or chest pain, or peripheral vascular disease with intermittent claudication.

Response Rate

A total of 253 letters were mailed to prospective subjects identified through the chart review; one was returned as undeliverable and is not included in the calculation of the response rate. Of the remaining 252, 143 patients returned the postcard, called the investigator on the telephone, or spoke with the nursing staff about the study when they came for their physician appointment. Out of the 143 patients who responded, 104 participated in the study. Of the remaining 39, 22 indicated willingness to participate in the study, but did not participate for one of the following reasons: 6 stated their willingness to participate but did not come for their scheduled appointment; 16 stated their willingness to participate but were unable because a convenient appointment time could not be arranged, or they were ineligible because of functional limitations other than breathing (e.g., recent total hip replacement, hip or back pain, or arthritis), or recurrent exacerbations of COPD. Ten patients who returned the postcard did not wish to participate after discussing the study with the investigator on the telephone. Seven others who returned the card did not participate for a variety of reasons, including three patients who returned postcards after data collection was completed, one patient who fell and broke her hip between the time she mailed the card and the investigator's phone call, one patient who had surgery to place an intratracheal oxygen catheter and could not arrange an interview appointment, and two patients who could not be reached by telephone. One of the latter was willing to participate in the study when he came to his physician's appointment, but was having an acute exacerbation of COPD at that time; the second did not come to her scheduled physician's appointment.

The proportion of positive responses to office recruitment is difficult to determine, since several of the initial recruitment efforts were made without the investigator's knowledge (i.e., physician or nurse practitioner mentioned the study to patients whom the investigator had not screened). However, after the third week of data collection, approximately 47 patients were approached in the office, of whom 30 participated in the study. Seven patients declined outright, while 10 stated their willingness to participate but did not return for their scheduled interview.

In summary, 143 of 252 (57%) of prospective subjects sent Letters of Introduction responded to the mailing, and 104 of the 252 (42%) participated in the study. In addition, 30 of approximately 47 patients (64%) approached in the office participated. Combining these two groups gives an overall response rate of 45%. However, since the investigator was not made aware of all of those approached in the office, the response rate in this group was probably closer to that of those receiving the mailing, and the overall response rate was probably about 42%.

A total of 134 subjects completed the study. Of these, eight were later deemed ineligible because they did not meet the inclusion criteria for the study. Subjects were excluded for the analysis because of a post-bronchodilator FEV_1 greater than 70% of predicted (n = 2), an MMSE score less than 23 (n = 2), a primary diagnosis of lung cancer rather than COPD (n = 3), or a hospitalization for COPD within the last three weeks (n = 1). Therefore, the final sample size included in the data analysis was 126. Based on an a priori power analysis and findings from previous research, this sample size was sufficient to detect the effect of social support on quality of life at a significance level of .05 and power of .80 (Cohen, 1988). Detection of the effect of social support was of particular interest because it is a variable that has the potential to be influenced by nursing interventions. Its effect in previous research, although relatively small, has been significant, contributing 4% to 14% of the explained variance in dependent variables (Burckhardt, 1985; Dimond, Lund, & Caserta, 1987). Since the effect of social support was expected to be the smallest of all the mediating variables, it was important that the sample size be large enough to detect its effect. Details of the power analysis can be found in the Appendix.

Sample Characteristics

The subjects ranged in age from 48 to 85 years (mean = 68.1, S.D. = 7.4). Sixty-nine (54.8%) were female, and 57 (45.2%) were male. A large majority of the subjects (n = 122, 96.8%) was Caucasian; only one (.8%) was African-American, one was Asian-American (.8%), and two were of mixed race (1.6%). Almost two-thirds of the subjects were married or living with a partner (n = 81, 64.3%); the remainder were widowed (n = 26, 20.6%), divorced (n = 12, 9.5%), separated (n = 5, 4.0%), or never married (n = 2, 1.6%). The modal number of years of school completed was high school, with a range from 5 to 18 years (Table 3-1). As expected in this sample of older people, 95 (75.4%) were retired, while 16 (12.7%) continued to work at least part-time. Fifteen subjects (11.9%) had been homemakers and, in the words of one woman, "you never retire from that".

Table 3-1
Years of School Completed by Study Subjects

Years of School Completed	N	Percent
Seventh grade or less	4	3.17
Eighth or ninth grade	11	8.73
Tenth or eleventh grade	21	16.67
High school graduate	48	38.10
Partial college[a]	37	29.37
College graduate	3	2.38
Graduate degree	2	1.59

Note. Categories based on Four Factor Index of Social Status (Hollingshead, 1975).
[a] Includes specialized training such as business or secretarial school.

A variety of diagnostic labels were used by the six physicians for the patients' lung diseases, including COPD, emphysema, chronic bronchitis, obstructive chronic bronchitis, asthmatic bronchitis, asthma, and bronchiectasis. Many patients had been diagnosed with more than one of these entities, but the overall picture as judged by the investigator was one of chronic airflow obstruction. The FEV1% in the sample ranged from 12% to 70% (mean = 39.5%, S.D. = 14.5), and subjects had had COPD for an average of approximately 11.2 years (range 2 months to 54 years, S.D. = 9.7). Estimated duration of disease is approximate only because patients had difficulty recalling how long they had known they had lung disease, and several responded to the question with the statement "all my life". Forty-five (35.7%) subjects had oxygen prescribed for home use.

Because potential subjects were identified through a chart review, some data were available on patients who were invited to participate in the study but did not do so. Participants did not differ from non-participants in age, gender, FEV_1%, or home oxygen use (Table 3-2). Therefore, subjects could be said to be representative of the target population on two study variables (age and disease severity), as well as on two additional disease or demographic variables (gender and home oxygen use).

Table 3-2

Comparison of Study Participants and Invited Non-participants[a] on Four Variables

Variable	N	Mean (S.D.)	*t*	p
Age				
Participants	126	68.12 (7.4)		
Non-participants	165	67.19 (10.3)	-0.896[b]	.371
Gender[c]				
Participants	126	1.556 (.499)		
Non-participants	165	1.473 (.501)	-1.400	.163
FEV_1%				
Participants	126	39.52 (14.49)		
Non-participants	155	42.77 (14.45)	1.876	.062
Home oxygen use[d]				
Participants	126	.373 (.486)		
Non-participants	162	.278 (.449)	-1.722	.086

[a] Patients meeting inclusion criteria by chart review and invited to participate who did not take part in the study.

[b] *t*-test for separate variances; assumption for equal variances ($\sigma_1^2 = \sigma_2^2$) not met ($F_{164,125}$, $p < 0.0001$). All other *t* tests are for pooled variances.

[c] Male = 1; Female = 2.

[d] No oxygen use = 0; Home oxygen prescribed = 1.

Measures

The instruments used to assess cognitive status and to operationalize demographic, disease, mediating, and outcome variables are described below. A description of the procedures used in the administration of the instruments or physiologic tests is included where applicable. Copies of all of the instruments are found in the Appendix.

Cognitive Impairment

As noted earlier, the Mini-Mental State Examination was used to screen subjects for the presence of cognitive impairment. This 30-point scale was developed to provide a simple measure of cognitive ability that could be used to screen patients for psychiatric disorders and dementia (Folstein & Folstein, 1975). The scale has two sections: the first measures orientation, memory, and attention; the second tests language (the ability to name objects, follow verbal and written commands, write a sentence), and constructional ability (the ability to copy a geometric figure). Thus, this latter part of the test requires adequate vision and hearing, as well as a minimum level of writing and reading skill.

Successful completion of items is scored by the interviewer, with one point assigned for each correct response. Out of a total of 30 possible points, a cut-off of 23/24 is usually recommended as the most sensitive and specific for "normal" cognition (i.e., absence of delirium or dementia; Anthony, LeResche, Niaz, von Korff, & Folstein, 1982; Folstein & Folstein, 1975). However, some investigators have found that age and education affect the MMSE score, and have recommended the use of additional screening measures or adjustments in cut-off scores in older subjects or those with low levels of education (Anthony et al., 1982; Uhlmann & Larson, 1991).

In this study, subjects were eliminated from the analysis if their score on the MMSE was 22 or less, rather than the usual 23. This decision was based on the fact that five of six subjects scoring 23 or less had less than a tenth grade education; two had less than an eighth grade education. The correlation between years of school completed and score on the MMSE in this sample was .248 ($p = .005$). In addition, when a subject scored 23 or less, the interviewer assessed comprehension of the other verbal and written questions by asking the subject to explain what he or she meant in choosing a particular response, and by making specific notes about difficulty the subject had in reading the items. In all but one case (that of the subject with the lowest MMSE score), the interviewer judged that the subject was not significantly cognitively impaired. In most cases, subjects missed items such as the address of the clinic (often stating "I don't know the street, I just know how to get here") or could not spell "world" backwards because they could not spell it forwards.

Internal consistency reliability has not been reported for the MMSE. Folstein and Folstein (1975) reported test-retest reliability at .827 over 24 hours, and .98 over 28 days in elderly depressed and demented patients. In 58 subjects without dementia or delirium admitted to a general medical ward, 24-hour test-retest reliability was .85; for 12 subjects with dementia, Pearson's r was .90, and for seven delirious subjects r was .56 (Anthony et al., 1982).

Evidence for construct validity of the scale is supported by its ability to differentiate between normals and psychiatric patients with diagnoses of uncomplicated depression, depression with cognitive impairment, and dementia. Mean scores in the four groups were 27.6, 25.1, 10.0, and 9.7 respectively (Folstein & Folstein, 1975).

In 76 patients referred for evaluation of possible dementia, correlations between the memory, attention, language, and constructional ability sections of the MMSE and other measures of these skills ranged from .44 to .69, with two exceptions. The items requiring subjects to name two objects and to write a sentence correlated poorly with other measures (r = .13 and .20 respectively). The language items also had poor sensitivity and specificity in screening for cognitive impairment (Feher et al., 1992).

Sensitivity and specificity of the MMSE as a whole have been found to vary with education, age, gender, race, and cut-off score (Anthony et al., 1982; Uhlmann & Larson, 1992). When a cut-off score of 23/24 was used in general medical patients with and without dementia, the MMSE had a sensitivity of 87% and specificity of 82%. When the cut-off score was lowered to 22/23, the overall sensitivity was 82.6% and specificity 86.5% (Anthony et al., 1982). Uhlmann and Larson (1992) found the maximum sensitivity and specificity in subjects completing grades 10 through 12 at a cut-off score of 23.

Demographic Variables

Age.

The subject's age was measured in years. The date of birth was abstracted from the clinic chart. In the few cases in which the date of birth was missing or in question (for example, when different ages were recorded in different sections of the chart), the subject was asked for the date of birth.

Socioeconomic status.

Socioeconomic status was measured with the Four Factor Index of Social Status, an instrument that uses occupation, education, marital status, and gender to rate subjects on a continuous numerical scale that has a possible scoring range from 8 to 66 (Hollingshead, 1975). In fact, gender does not enter into calculation of the score, making this a three-factor index.

The Four Factor Index uses marital status and sources of income other than work (e.g., child support from a divorced spouse) to determine the number of people contributing to earnings included in the score calculation.

Years of education for each contributor is categorized into 1 of 7 levels, and each individual score is weighted by a factor of 3. Each contributor's occupation is categorized into 1 of 9 levels, and the score is weighted by a factor of 5. These weighted scores are summed, and if there is more than one person contributing to earnings, divided by the number of contributors. The weighted, summed, and averaged result is the final score.

Hollingshead (1975) reported that occupational scores assigned by the Four Factor Index increased directly with years of education. Correlations between the median years of school completed and the occupational score were .835 for males and .849 for females. A comparison between occupational scores on the Four Factor Index and occupational prestige scores developed by the National Opinion Research Center yielded a correlation of .927.

In a comparison of three measures of socioeconomic status, Gottfried (1985) reported correlations of .79 and .73 between the Four Factor Index and the Revised Duncan Socioeconomic Index and the Siegel Prestige Index, respectively. When only the occupational scores on the Four Factor Index were examined in relation to the Duncan and the Siegel, these correlations rose to .85 and .79. Gottfried (1985) found the Four Factor Index the most flexible of the three instruments because it could account for all wage earners in a family, while the others were useable only for individuals or heads of households.

Disease Variables

Disease severity. In accordance with the recommendations of the American Thoracic Society (1991), the percent predicted FEV_1 (FEV_1%) was used as an objective measure of disease severity in this study. The results of simple spirometry (FEV_1, FVC, and FEV_1/FVC) were abstracted from the patient's chart when these data had been obtained within the previous 12 months. Those subjects who had not had spirometry recorded within that period performed three forced expiratory maneuvers as part of the study.

There are many potential sources of variation in lung function measurements, including technical (instrument, subject, posture, observer, procedure, software, temperature, altitude) and biological (circadian and seasonal effects, age, gender, race, environmental factors, and others) sources (ATS, 1991). This investigation attempted to control for as many of these sources of variation as possible. The American Thoracic Society (1979, 1987a) has published standards for the conduct of spirometric testing, and the laboratory within the clinic where subjects had been tested adheres to these standards (K. Dorr, personal communication, February 28, 1992). Thus, the technical aspects of the testing for those subjects who had been tested in the lab were well controlled.

The investigator conducted all of the pulmonary function tests for those subjects who had not had spirometry performed in the laboratory within the past year. The investigator had had previous experience in conducting these tests both in her master's research project (Anderson, 1981) and in subsequent workshops and classes. In addition, she underwent training by the laboratory director so that the technique used in the study was the same as that used in the lab.

Tests were performed with a Spirolink (Biocom) spirometer connected to a portable computer equipped with the software program Pneumotach 4000 (Med Science). The Spirolink meets criteria for accuracy established by the ATS (K. Dunyaski, personal communication, January 12, 1993). The spirometer was calibrated each day. The date, time of day, temperature, and barometric pressure were first entered into the computer. A 3000 cc air syringe was then emptied through the mouthpiece at two different flow rates to ensure accurate calibration.

Spirometric testing was conducted in one of the rooms available for use by the study. Subjects were instructed in the forced vital capacity maneuver prior to beginning. The nares were then closed with a nose clip and the test begun. Subjects were told to take in the biggest breath possible, then to blow into the mouthpiece as hard and fast as they could. They were to keep blowing until told to stop, at which point they were instructed to again take in as big a breath as possible. After a rest period, this maneuver was repeated until three good curves were obtained, or until the subject could not perform any more of these maneuvers.

To conform with laboratory standards, a printed copy of the best FEV_1 combined with the best FVC was made. The software compared subject results to predicted normals (Knudson, Slatin, Lebowitz, & Burrows, 1976), yielding a percent of predicted value for FEV_1, FVC, and FEV_1/FVC. The absolute and percent predicted values for FEV_1, FVC, and FEV_1/FVC were abstracted to the subject's study questionnaire, and the hardcopy of the test results was filed in the subject's clinic chart.

In absolute terms, a lower value for the $FEV_1\%$ indicates a higher degree of airflow limitation and, therefore, increased disease severity. However, for the purpose of consistency of direction in sign of all measures in the study, each subject's $FEV_1\%$ was multiplied by -1 prior to data analysis.

Dyspnea. Subjects were asked to rate dyspnea intensity experienced over the past week using a Dyspnea Visual Analogue Scale (DVAS). The DVAS has been used in several nursing research studies of COPD and asthma (Carrieri & Janson-Bjerklie, 1986; Gift & Cahill, 1990; Gift, Plaut, & Jacox, 1986; Janson-Bjerklie, Carrieri, & Hudes, 1986; Lush, Janson-Bjerklie, Carrieri, & Lovejoy, 1988)

The DVAS consisted of a 100 mm horizontal line with anchors at either end describing the two extremes of dyspnea intensity ("not at all short of breath" and "shortness of breath as bad as it can be"). There were no markings or intervals on the scale. Subjects were asked to place a mark on the line that described, on average, how severe their shortness of breath had been over the past week. Scores were obtained by measuring the distance of the mark in millimeters from the lower end of the scale.

To ensure understanding of how to use the scale to rate dyspnea, subjects were first given one or two examples for practice on phenomena unrelated to dyspnea. All subjects were given one example; the interviewer decided whether a second example was needed based on any difficulty experienced by the individual subject on the first example. The interviewer rated the degree of difficulty experienced by the subject on a 4-point scale ranging from "No difficulty" to "Extreme difficulty".

Because dyspnea is a dynamic phenomenon, test-retest reliability of the DVAS is difficult to demonstrate. However, Stark, Gambles and Lewis (1981) found high levels of reproducibility in DVAS ratings of breathlessness when six normal subjects exercised to a standardized maximum at three one-week intervals. There was little variation in maximum DVAS scores in six stable COPD patients who exercised to a symptom-limited maximum, with a mean coefficient of variation of 6 and range of 2 to 13 (Muza, Silverman, Gilmore, Hellerstein, & Kelsen, 1990).

Several studies support the construct validity of the DVAS. In 11 subjects having an acute asthma attack, the correlation between the DVAS and Peak Expiratory Flow Rate (PEFR) ranged from .29 to -.89, that is, ratings of dyspnea increased as bronchoconstriction led to decreased air flow rates (Gift et al., 1986). A significant _t_ test result was obtained for the relationship between scores on the DVAS and PEFR in 20 males with COPD (Gift, 1989). DVAS scores increased in a linear fashion with increased ventilation during exercise in healthy subjects (Stark et al., 1981; Wilson & Jones, 1989) and patients with COPD ($r = .98$; Muza et al., 1990). Finally, DVAS scores correlated with ratings of dyspnea on a Borg scale in normals ($r = .84$; Wilson & Jones, 1989) and patients with COPD ($r = .99$; Muza et al., 1990).

Functional status. Functional status was measured in two ways. Four subscales of the Arthritis Impact Measurement Scales 2 provided a self-report of functional status. A 6-minute walk provided an objective measure of functional status. The walk test results were used in the statistical analyses that tested how well the data fit the theoretical model (see Chapter 5).

Walk tests of either 6 or 12 minutes have been widely used in studies of COPD patients (Davidson, Leach, George, & Geddes, 1988; Guyatt, Berman, & Townsend, 1987; Johnson, Woodcock, Rehahn, & Geddes, 1983; Niederman et al., 1991; Rice, Kronenberg, Hedemark, & Niewoehner, 1987; Weaver & Narsavage, 1992). Guyatt et al. (1985) endorse using the 6-minute walk as a measure of functional status in chronic heart and lung disease because it appears to measure the patient's ability to undertake activities of daily living that are physically demanding, and because it is relevant to their everyday lives (see below).

Walk tests have been found to be highly reproducible when subjects are given the opportunity to do two practice walks prior to the test(s) that "count"; distances walked plateau after the second test (Butland, Pang, Gross, Woodcock, & Geddes, 1982; Guyatt et al., 1984; McGavin, Gupta, & McHardy, 1976). However, although the increases in distance walked between first and second tests have been statistically significant, the size of the increases (approximately 7% to 8% in the three studies named above) can be argued to be clinically insignificant. In addition, achieving the maximum level of performance may be more important when the walk test is used as a measure of treatment effect than when it serves as a predictor variable. Based on these considerations, as well as the added burden involved in asking subjects to do three 6-minute walks, no practice walks were used in this study.

The 6-minute walk test has been found to correlate well with other measures of exercise tolerance and functional status. Correlation with the 12-minute walk in 30 patients with various respiratory diseases was .96 (Butland et al., 1982); the 12-minute walk had previously been shown to correlate with maximum oxygen uptake (r = .52) and ventilation (r = .53) in 29 patients with chronic bronchitis who exercised on a bicycle ergometer (McGavin et al., 1976). Guyatt et al. (1985), reported that the 6-minute walk was significantly correlated with four self-report measures of functional status in 43 subjects with chronic heart and lung disease: the Rand Instrument (r = .589); the Oxygen Cost Diagram (r = .495); the Baseline Dyspnea Index (r = .590), and the Specific Activity Scale (r = .473). Correlation of the 6-minute walk with bicycle ergometry in the same study was .579. However, the ergometer results did not correlate with the other functional status measures except for the Oxygen Cost Diagram (r = .891), leading to the authors' conclusion that the 6-minute walk is superior to bicycle ergometry as a measure of functional status in chronic heart and lung disease. Finally, Jones, Baveystock, and Littlejohns (1989) reported that the 6-minute walk had a moderately strong negative correlation with the Sickness Impact Profile (r = -.64) in 141 patients with chronic airflow obstruction. Correlation with the score on the SIP physical subscale was -.72.

The second measure of functional status consisted of four subscales of the most recent revision of the Arthritis

Impact Measurement Scales (AIMS2; Meenan, Mason, Anderson, Guccione, & Kazis, 1992). The original AIMS (AIMS1) was developed as an outcome measure for clinical trials in arthritis, but has been tested in other clinical populations (Mason, Weener, Gertman, & Meenan, 1983; Meenan, 1982; Meenan, Gertman, Mason, & Dunaif, 1982)) and used as a measure of functional impairment in COPD (Moody et al., 1990; 1991). The AIMS2 represents an effort to increase the sensitivity and comprehensiveness of the original instrument by deleting weak items, formatting all items in a consistent manner, adding some new dimensions that were previously omitted, and incorporating a component related to respondents' satisfaction with their health status (Meenan et al., 1992). Most of these revisions have not significantly changed the subscales used in this study, so that the AIMS2 results would be expected to be comparable to those for COPD patients using the AIMS1 version of the subscales.

The Mobility, Walking and Bending, Self-Care Tasks, and Household Tasks subscales of the AIMS2 were used in this study. Each subscale consists of four or five items. The items ask the respondent to rate on a 5-point scale ranging from "all days" to "no days", or "always" to "never" how often during the past month they were able to perform the stated activity. Low scores on the subscales indicate better function, and high scores indicate poor function.

Subscale scores are calculated by summing the responses for all items in that subscale and transforming them to a standardized score such that the lowest possible score is zero and the highest possible score is 10 (Meenan et al., 1992). In this study, the standardized subscale scores were added to produce an overall score for functional impairment.

Alpha internal consistency reliability coefficients for the four AIMS2 subscales ranged from .81 to .95 in 299 patients with arthritis. Test-retest reliabilities over 2 weeks in 45 arthritis patients ranged from .81 to .91 (Meenan et al., 1992).

Development of the AIMS1 was based on two established measures of health status, the Rand Health Insurance Study instruments and the Bush Index of Well-Being. To assure a multidimensional conceptualization of health, the psychological, social, and activities of daily living dimensions were added (Meenan, Gertman et al., 1982). Thus, content validity of the AIMS1 was assured. The AIMS2 was based on the AIMS1, assuring its content validity as well (Meenan et al., 1992).

Evidence for construct validity of the AIMS1 includes its significant correlation with physician ratings of patients' functioning. Factor analysis of the scale resulted in items for each subscale loading on a single factor, except for the Household subscale, which loaded on two factors (Meenan, Gertman et al., 1982).

of the AIMS2 after administration to patients with osteoarthritis and rheumatoid arthritis resulted in all subscale items loading on a single factor, with the exception that items from the Mobility subscale loaded on two factors in the osteoarthritis group.

Mediating Variables

Depression. Depression was measured with the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The BDI was designed to measure the behavioral aspects of depression. In the 32 years since its introduction, the BDI has been widely used for assessing the intensity of depression in psychiatric patients and for detecting depression in normal populations (Beck, Steer, & Garbin, 1988).

The 1978 revision of the BDI was used in this study (Beck, Rush, Shaw, & Emery, 1979). Each of the 21 items asks respondents to select one or more statements reflecting how they have felt over the past week. For example, statements for Item 1 are: (0) I do not feel sad; (1) I feel sad; (2) I am sad all the time and I can't snap out of it; (3) I am so sad or unhappy that I can't stand it. The number corresponding to each statement equals the item score; these are summed to yield a possible total scale score of 0 to 63 (Beck et al., 1979). Higher scores represent higher levels of depression.

Beck, Steer, and Garbin (1988) summarized the psychometric characteristics of the BDI that had been reported during the first 25 years of its use. Internal consistency reliability coefficients (Cronbach's alpha) in 15 studies of non-psychiatric populations ranged from .73 to .92, and in two studies of adult medically-ill populations were .81 and .86. Test-retest reliability for adult non-psychiatric subjects was .78 over 2 weeks, .86 in depressed older adults over 6 to 21 days, and .76 in non-depressed older adults over 6 to 21 days.

Content validity of the instrument is supported by the fact that items were originally based on systematic observations of symptoms and attitudes in depressed patients undergoing psychotherapy. Symptoms thought to be specific to depression and consistent with the literature on depression were selected (Beck et al., 1961). Today, scale items remain consistent with the American Psychiatric Association's criteria for depression (American Psychiatric Association [APA], 1987), with some deliberate exceptions. The BDI does not ask about increased appetite or increased sleep because these symptoms were believed to be much less common than their opposites in depressed people. Agitation was omitted because it was believed to be a clinical sign rather than a symptom amenable to self-report (Beck, Steer, & Garbin, 1988).

Evidence for construct validity comes from moderate to high correlations between the BDI and other measures of depression in non-psychiatric samples. Correlations with the BDI range between .73 and .80 for the Hamilton Rating Scale for Depression, .66 and .86 for the Zung Self-Reported Depression Scale, and .56 and .75 for the Depression Scale of the Minnesota Multiphasic Personality Inventory. Pearson's r for the BDI and the Multiple Affect Adjective Checklist Depression Scale was .63 (Beck, Steer, & Garbin, 1988).

Anxiety. The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988), a 21-item scale developed for the explicit purpose of discriminating anxiety from related constructs such as depression, was used to measure anxiety. Each item represents a common symptom of anxiety, and respondents are asked to rate how much the symptom has bothered them over the past week. A 4-point Likert-type scale ranging from zero ("not at all") to three ("I could barely stand it") yields a total possible scale score of 1 to 63, with higher scores indicative of higher anxiety.

Initial psychometric testing of the scale in 160 adults with affective or anxiety disorders found an alpha internal consistency reliability coefficient of .92. Test-retest reliability in the same subjects was .75 over a one-week period (Beck, Epstein et al., 1988).

Content validity of the BAI was assured by the methods used to develop it. A pool of items for potential inclusion in the BAI was generated from three self-report questionnaires administered as part of an intake evaluation at a psychiatric clinic. The content of the questionnaires included somatic, affective, and cognitive symptoms of anxiety, common side effects of anti-anxiety and anti-depressive medications, and a broad range of anxiety symptoms occurring in specific situations (such as dealing with a problem situation). This large item pool was reduced through item analyses, factor analyses and sequential administration to patient samples until the final scale consisting of 21 common symptoms of anxiety remained (Beck, Epstein et al., 1988)

Evidence for construct validity of the BAI comes from a series of analyses aimed at linking it to other measures of anxiety, and discriminating it from measures of depression. Factor analysis of the BAI revealed a two-factor structure: somatic symptoms made up the first factor, and subjective anxiety and panic symptoms made up the second factor. When the BAI was factor analyzed with the BDI, only one item from the BAI loaded on the depression factor (Beck, Epstein et al., 1988).

The BAI was moderately correlated with two other measures of anxiety: the Cognition Checklist-Anxiety ($r = .51$) and the Hamilton Rating Scale for Anxiety ($r = .51$). Correlations with measures of depression were low to moderate: $r = .22$ with the Cognition Checklist-Depression; $r = .25$ with the Hamilton Rating Scale for Depression; $r =$

.15 with the Hopelessness Scale; and r = .48 with the BDI. Although the correlation of the BAI with the BDI was moderately high, the authors noted that the BDI correlated more highly with other measures of anxiety than with the BAI (e.g., r = .60 with the State Anxiety Inventory and r = .73 with the Trait Anxiety Inventory; Beck, Epstein et al., 1988).

Self-esteem. Self-esteem was measured with the Rosenberg Self-Esteem Scale (Rosenberg, 1965). This 10-item scale was developed to measure the direction of self-attitude (either positive or negative) in late adolescence, but has been used subsequently in social science (Pearlin, Menaghan, Lieberman, & Mullan, 1981), nursing (Lewis, 1982) and gerontological research (Caserta, Lund, & Dimond, 1989; Ward, 1977) with general and ill adult populations. A 4-point Likert-type scale ranging from "strongly agree" to "strongly disagree" yields a possible scoring range of 10 to 40, with higher scores indicating higher self-esteem.

Internal consistency reliability coefficients for the Self-Esteem Scale (SES) were reported at .74 in a sample of elderly widowed subjects (Ward, 1977), and .87 in a sample of late-stage cancer patients (Lewis, 1982). Test-retest reliability over a 2-week period was .85 in a sample of 44 college students, of whom 7 had had serious emotional problems and 37 had had no such problems (Silber & Tippett, 1965).

Rosenberg (1965) developed the SES with the goal of producing a unidimensional scale measuring the self-acceptance component of the self-esteem construct. Although he did not perform a formal psychometric assessment of the scale, he noted that adolescents scoring low on the SES were more likely to score high on a measure of depressive affect, display more symptoms of anxiety, be rated low on leadership potential and class participation by peers, and be less respected by peers than those higher in self-esteem.

In a multi-trait multi-method study (Silber & Tippett, 1965), correlations between the SES and self-esteem measured by different methods ranged from .56 to .83. The correlation between the SES and a different concept (stability of self-image) measured by the same method was .53, and between the SES and a different concept measured by a different method ranged from .21 to .40. The pattern of correlations was in agreement with expectations, thus lending evidence of construct validity to the SES.

<ins>Dispositional optimism</ins>. Dispositional optimism was measured with the Life Orientation Test (LOT), a 12-item instrument consisting of four positively-worded items, four negatively-worded items, and four unscored "filler" items. The respondent indicates agreement with each of the items on a 5-point Likert-type scale ranging from "strongly agree" to "strongly disagree". The range of possible scores is 0 to 32 (Scheier & Carver, 1985).

Scheier and Carver (1985) reported an internal consistency reliability coefficient of .76 when the LOT was administered to 624 undergraduate students. Test-retest reliability in 142 undergraduates was .79 over a four-week period (Scheier & Carver, 1985).

Items for the LOT were developed to reflect generalized outcome expectancies, irrespective of the source of the expectation (e.g., self, environment, or luck). Equal numbers of positive and negative statements were sought, and a factor analysis confirmed a two-factor structure, one consisting of items worded positively and one of items worded negatively (Scheier & Carver, 1985).

Support for construct validity of the LOT comes from the fact that correlations with measures of related constructs are in the expected directions: internal locus of control ($r = .34$), self-esteem ($r = .48$), hopelessness ($r = -.47$), depression ($r = -.49$), perceived stress ($r = -.55$), alienation ($r = -.17$ to $-.40$), and social anxiety ($r = -.31$ to $-.35$). In factor analyses of the LOT with Rotter's I-E (locus of control) scale, Rosenberg's SES, Beck's Hopelessness Scale, and the BDI, items from the LOT tended to load on a separate factor from other factors that emerged (Scheier & Carver, 1985).

Social support. Perceived social support was measured in this study with the Personal Resource Questionnaire (PRQ) Part 2 (Brandt & Weinert, 1981; Weinert, 1987; Weinert, 1988; Weinert & Brandt, 1987). PRQ Part 2 consists of 25 statements to which the subject responds on a seven-point Likert scale from "strongly agree" to "strongly disagree". Possible scores range from 25 to 175, with higher scores indicating higher levels of perceived support (Weinert, 1988). The PRQ has been used in more than 75 nursing research studies over the approximately 10 years of its existence (Weinert, 1988).

In four studies of older adults, the internal consistency reliability coefficients ranged from .85 to .90. Alphas for five empirically derived subscales ranged from .54 to .80. However, factor analysis of Part 2 in subsequent samples has revealed a three-factor solution with substantially higher alphas for the three subscales generated in the factor analysis (Weinert, 1988). Cronbach's alpha was .92 when the PRQ Part 2 was administered to 30 elderly oxygen-dependent COPD patients (Lee, Graydon, & Ross, 1991). Test-retest reliability for the PRQ Part 2 over 4 to 6 weeks in 100 young adults was .72 (Weinert & Brandt, 1987).

Weiss' model of relational functions served as the basis for the content of the PRQ Part 2. The five functions he identified were the indication that one is valued and is a part of a group, the provision for attachment or intimacy, the opportunity for nurturance, and the availability of informational, emotional, and material help (Brandt &

Weinert, 1981). However, factor analyses of the scale have revealed a three-factor structure: intimacy-assistance, nurturance, and integration-affirmation (Weinert, 1988).

Evidence supporting the construct validity of the scale is limited. In two studies, PRQ Part 2 had a low positive correlation (r = .32) with extroversion, and a low negative correlation (r = -.28) with neuroticism. Correlations with anxiety and depression were moderately negative (r = -.37 and -.39 for anxiety, and -.42 and -.33 for depression; Weinert, 1987; Weinert & Brandt, 1987).

Outcome Variable

Quality of life. Quality of life was measured with a 16-item version of the Quality of Life Scale (QOLS; Flanagan, 1978). The original 15-item scale asks respondents to rate satisfaction with their lives in five domains: physical and material well-being; relations with other people; social, community, and civic activities; personal development and fulfillment; and recreation. Based upon interviews with chronically ill adults who were asked to identify terms they would use to describe their quality of life, one item related to independence has been added to the original scale (Burckhardt, Woods, Schultz, & Ziebarth, 1989).

As recommended by Burckhardt et al. (1989), the 7-point Delighted-Terrible response scale was used in place of Flanagan's original rating scale of adequacy with which needs are met. The Delighted-Terrible scale was developed by Andrews and Withey (1976) to add an affective quality to respondent ratings, to maximize discrimination among respondents, and to reduce skewness that occurred with scales having fewer categories. Higher scores on the QOLS indicate higher perceived quality of life; the range of possible scores on the revised instrument is 16 to 112. The QOLS has been used as a measure of quality of life in a study of patients who had experienced sudden cardiac death (Underhill, 1992).

The QOLS had high internal consistency reliability when administered to 227 chronically ill adults three times over a 6-week period (r = .86 to .89). Test-retest reliability in the same sample was .78 between the first and second measurements (a 3-week interval), .84 between the second and third measurements (a 3-week interval), and .76 between the first and third measurements (a 6-week interval; Burckhardt et al., 1989).

Content validity of the QOLS rests on the fact that the original 15 items were developed inductively from 6500 critical incidents identified through interviews with a broad sample of Americans (Flanagan, 1978). As noted above, responses by chronically ill adults to open-ended questions about the meaning of quality of life supported the domains identified by Flanagan. One item related to independence was added to the scale based on the latter responses

(Burckhardt et al., 1989).

Evidence for construct validity of the scale includes the finding that subjects with stable chronic illnesses rated their quality of life higher than subjects with unstable chronic illnesses (Burckhardt et al., 1989). The QOLS correlated highly with another quality of life measure, the Life Satisfaction Inventory-Z (r = .67 to .72 over the three measurement periods) and only moderately with two health status measures, the Duke-UNC Health Profile (r for various subscales ranging from .25 to .73), the Arthritis Impact Measurement Scales (r for different subscales ranging from -.28 to -.66), and the Ostomy Adjustment Scale (r = -.05 to .43; Burckhardt et al., 1989).

Procedure

Approximately two-thirds of the interviews were conducted by the principal investigator. A trained research assistant who was a master's prepared psychiatric nurse with excellent interviewing skills conducted the remainder of the interviews. Interviews took place in one of the following rooms within the clinic: one of two rarely-used examination rooms; an office reserved for use by research assistants conducting studies for pharmaceutical companies; or the office of the nurse practitioner. Each of these rooms was equipped with comfortable armchairs and could accommodate the interviewer, the subject and his or her medical equipment (such as oxygen tank, walker, or wheelchair), and rarely, a spouse or adult child who accompanied the subject.

Details regarding the conduct of the interviews are described below. Copies of the Study Checklists and Interview Guide are shown in the Appendix.

Subjects were first asked to read the Consent Form (Appendix) and to ask the interviewer any questions they had about the study. Once these questions were answered to the subject's satisfaction and the interviewer believed that the subject understood what he or she would be asked to do, the Consent Form was signed.

In preparation for spirometry, subjects who had not had the test performed in the preceding 12 months were first asked to use their inhaled bronchodilator for the prescribed number of puffs. If they had used the medication within the previous hour, they were not asked to repeat the dose. Subjects who had had spirometry results recorded within the past 12 months were not asked to repeat the test.

Next, the interviewer administered the Mini-Mental State Examination, followed by the Dyspnea Visual Analogue Scale. The subject was then given the questionnaire consisting of all the remaining self-report instruments, and instructions for completing it. If a family member was present, the subject was instructed not to ask him or her how to answer any of the questions. At this point, the interviewer left the room, returning to check on the subject approximately every 5 minutes.

After the subject was finished with the questionnaire, the interviewer returned and reviewed the questionnaire for items or pages that might have been omitted. In the case of unanswered single items, subjects were asked whether they had intended to not answer the item or if it had been unintentionally omitted. If the omission was unintentional, subjects were asked to complete the item. Similarly, when a whole page had been unintentionally left blank, the subject was asked to complete the items. Subjects were not asked to complete items that they had intentionally omitted.

Next, the interviewer calculated the subject's score on the Beck Depression Inventory (BDI). If the scale score indicated significant depression (i.e., a score >18), this result was discussed with the subject. The interviewer then explained her ethical obligation to notify the physician of the score. In no case did a subject object to the need to report the depression score to the physician. (Indeed, most were quite open about the fact that they felt depressed, and seemed genuinely grateful to have their mood acknowledged.) The study protocol also required that the physician be notified if the subject selected one of the following responses to the suicide item on the BDI: "I would like to kill myself" or "I would kill myself if I had the chance". However, no subject selected either of these responses.

The interview portion of the study concluded with the interviewer asking the subject a series of questions relating to demographic data, length of illness and treatment, smoking history, and participation in support groups or pulmonary rehabilitation programs. Length of the interview and questionnaire portion of the study ranged from 30 minutes to 2 hours and 30 minutes, with most sessions lasting approximately 1 hour.

Following the interview, subjects needing spirometry were asked to perform three forced expiratory maneuvers (as described earlier). Finally, all subjects performed the 6-minute walk test. After a brief rest, subjects were thanked for their participation and the study was concluded.

To evaluate the possibility that the use of an inhaled bronchodilator by some subjects and not others might have had an effect on the distance walked, a $\underline{t}$ test was performed to compare two groups: those who did not have spirometry performed at all on the study day, and those who had spirometry performed by the principal investigator. The distances walked by the two groups were comparable (mean = 296.77 for the group not having spirometry, and 282.64 meters for the group having spirometry), and no significant difference was found between them ($\underline{t}$ = .665, p = .508). Subjects who had spirometry performed in the lab on the study day (n = 19) were not included in the comparison because data were not collected as to whether the subject was tested before or after participation in the study. Depending on the order of lab and study appointments, some of these subjects would have used a bronchodilator in the preceding hour, while others would have been instructed not to use their inhaler prior to their laboratory appointment.

Protection of Human Subjects

The study proposal was approved by the Committee on Human Research at Oregon Health Sciences University (Appendix).

Informed consent was obtained from each participant. For most subjects (those recruited in advance of their physician's appointment), the study was explained on three separate occasions: in the Letter of Introduction, during the telephone contact, and in the Consent Form. For subjects recruited in the office, the study was explained briefly before asking if they were willing to participate, and in more detail in the Consent Form. Subjects were encouraged to read the entire form and to ask any questions they had before signing it. Any subject who declined to participate at any of these times was thanked for listening and considering participation in the study, and no further appeals were made. Also, patients who had been sent a Letter of Introduction but did not return the postcard were not approached again when they came to the clinic for their doctor's appointment.

Subjects were not compensated for their participation in the study. During the telephone contact, several prospective subjects asked what benefits would accrue to them if they took part in the study. The investigator explained that, while there were no tangible benefits, they would have the satisfaction of knowing that they might help other people with COPD in the future. A few patients found this explanation inadequate and declined to participate.

As noted above, all of the interviews were conducted in separate private offices or examination rooms within the physicians' office suite. No data were shared with the physicians, nurses, or office staff except for the depression scores (when indicated) and spirometry results. Depression scores were reported directly to the physician. Spirometry results were filed in the patient's clinic chart. Patients without recent spirometry were often the longest-term or sickest patients, and these data provided a progress report for the physician without billing the patient for the test.

Each subject was assigned an identification number. Responses to interview and questionnaire items were identified by the assigned subject number only. Data were coded and entered by subject number into a personal computer in the investigator's home. The original records of the interviews were kept in a file drawer accessible only to the investigator. A record of subject names and identification numbers was kept in a file separate from the data. By prior agreement, results of the investigation were to be shared with the office staff in the form of a summary report only

(K. Dorr, personal communication, March 2, 1992).

Missing Data

Despite the length of the questionnaire, there were very few missing data in this study. Each of 14 different subjects omitted one item on the questionnaire. Only one item was omitted by more than one subject. Because the amount of missing data was very small and there was no pattern evident in the missing data, the subject's mean item score for that instrument was substituted for the missing item. That is, if a subject omitted Item I on the Beck Anxiety Inventory, his or her mean item score for the BAI was assigned for Item I. This procedure is recommended by Tabachnick and Fidell (1989) when few data points are missing from a moderately large data set.

Walk test results were missing for five subjects. Two of these patients were wheelchair users who walked for 2 minutes and were unable to continue due to severe dyspnea or weakness. One subject refused to walk longer than 3 minutes because she did not want to wear herself out for the rest of the day. One subject was late for another appointment and could not stay for the 6-minute walk, and one subject had invalid data due to a malfunctioning stopwatch. The group mean for the 6-minute walk was assigned to each of these subjects, representing a conservative means of estimating missing data in a moderate-sized data set (Tabachnick & Fidell, 1989).

Psychometric Performance of the Instruments

Internal consistency reliabilities (Cronbach's alpha) were computed for all of the summated rating scales used in the study; these are shown in Table 3-3. All of the scales met the minimum criterion of .70 for internal consistency, and all but two (the Life Orientation Test and the Self-esteem Scale) met the criterion of .80 recommended by Nunnally (1978) as adequate for most research.

Table 3-3
Internal Consistency of Study Instruments

Instrument	Cronbach's alpha
Beck Depression Inventory	.80
Beck Anxiety Inventory	.88
Rosenberg Self-esteem Scale	.77
Life Orientation Test	.72
Personal Resource Questionnaire	.89
Quality of Life Scale	.83

Note. N = 126 for all scales

Data Analysis

The data were analyzed using the Crunch Version 4 software program (Crunch Software Corporation, 1991) for personal computers.

Path analysis was the method chosen to evaluate how well the data fit the hypothesized model of quality of life in COPD. Path analysis is a method that can be used to test a causal model "formulated by the researcher on the basis of knowledge and theoretical considerations" (Pedhazur, 1982,

p. 580). In other words, theory (in this case, stress and coping theory) determines the placement of variables in the model, and placement or ordering of variables represents hypothesized causal relationships. Because it is based on observational, not experimental, data, path analysis allows the researcher to evaluate the consistency with which the data fit the model and lend support to the hypothesized relationships, but does not demonstrate causality. Results of path analysis may substantiate the model, or may lead to its reformulation (Miller, 1977).

Theoretical Assumptions

Path analysis requires that several theoretical and statistical assumptions be met. One theoretical assumption of regression, and hence path analysis, is that the model is correctly specified. Such a model includes all relevant variables but excludes irrelevant ones, and uses a linear and additive model appropriately (i.e., the relationships are not non-linear or non-additive; Pedhazur, 1982). It is impossible to know the full reality of a social-psychological situation, and all models represent over-simplifications of reality. Therefore, in order to avoid specification errors, the model to be tested must be based on theory and the results of past research (Land, 1969; Pedhazur, 1982). In the present study, variables were selected and relationships were hypothesized based on clinical observation, previous research findings, and the cognitive theory of stress and coping. Therefore, although the specific model in this study had not been tested before, it was believed to be adequately specified.

Path analysis requires that the proposed model be a recursive system, that is, there are no feedback loops or two-way relationships (Miller & Stokes, 1975; Pedhazur, 1982). Although some of the relationships among variables in this study could be argued to be bi-directional, the proposed model of quality of life tested only uni-directional hypotheses, making it a recursive model.

Statistical Assumptions

Prior to executing the path analysis, the data were examined in several ways to identify outliers and assess whether the necessary statistical assumptions (i.e., those for multiple regression and path analysis) were met.

First, descriptive statistics (range, mean, median, mode, and standard deviation) were computed for each of the predictor variables and the outcome variable, quality of life. Normal probability plots were examined for skewness and kurtosis, and for the presence of outliers. When a subject's score on a given variable was greater than three standard deviations from the mean, it was considered an outlier, and the subject was assigned the score of the person closest to him or her that was less than three standard deviations from the mean. This step was necessary in only two instances. The distributions of scores for all of the variables were judged to be normally distributed based on visual inspection and the values for skewness and kurtosis, thus meeting one assumption for regression analysis.

Next, scatter diagrams were generated for the correlation of each predictor variable with quality of life. These plots were examined for the presence of outliers and for linearity of the relationships. No extreme outliers were identified from the scatter diagrams after cases not meeting the inclusion criteria for the study were deleted. The relationships between the predictor variables and quality of life were judged to be linear by a visual examination of the plots.

A regression analysis in which all of the predictors were forced into the equation was then performed. The standardized residuals for the prediction equation were plotted against the predicted quality of life score and examined for outliers and homoscedasticity. Residuals for two subjects were more than two standard deviations greater than their predicted score, and one subject had a residual more than two standard deviations less than the predicted score. All three of these subjects had low quality of life scores, thus contributing to increased scatter at the low end of the plot. However, the decision was made to retain these three subjects in the analysis based on the fact that these represented real people, and on a desire to use all of the data.

Additional assumptions of multiple regression are that the data must be measured at the interval level, and that the measures must be reliable. Each of the instruments used in this study produced interval-level data, and the instruments were selected, among other reasons, for their reliability as demonstrated by past use in research.

Beyond the assumptions of regression, path analysis requires that the residuals for each variable are not correlated with the variables that preceded it in the model (Pedhazur, 1982). This assumption was tested for each dependent variable in the quality of life model by looking at how the residuals from each regression correlated with the preceding predictor variables. Each equation tested yielded a correlation of zero ($r = 0.000$) between predictor variables and residuals.

Path Analysis

After each of the assumptions for regression and path analysis had been addressed, a series of regression analyses was run. Variables entered at each step of the path analysis are shown in Table 3-4. Derivation of the path coefficients from individual steps in the analysis are discussed in Chapter 4.

The *a priori* significance level for the standardized regression coefficients was set at .05 (two-tailed). Direct, indirect, total, and non-causal effects were then calculated using either a computer or a hand calculator. Results of the analyses are described in detail in Chapter 4.

Table 3-4
Regression Equations Used to Test the Path Model

Step	Dependent Variable	Independent Variables
1.	Socioeconomic status	Age
2.	Disease severity	Age Socioeconomic status
3.	Dyspnea	Age Socioeconomic status Disease severity
4.	Functional status	Age Socioeconomic status Disease severity, Dyspnea
5.	Depression	Age Socioeconomic status Disease severity Dyspnea Functional status
6.	Anxiety	Age Socioeconomic status Disease severity Dyspnea Functional status
7.	Self-esteem	Age Socioeconomic status Disease severity Dyspnea Functional status
8.	Optimism	Age Socioeconomic status Disease severity Dyspnea Functional status

Table continues on next page.

Table 3-4 (Continued)
Regression Equations Used to Test the Path Model

Step	Dependent Variable	Independent Variables
9.	Social support	Age Socioeconomic status Disease severity Dyspnea Functional status
10.	Quality of life	Age Socioeconomic status
11.	Quality of life	Age Socioeconomic status Disease severity
12.	Quality of life	Age Socioeconomic status Disease severity Functional status Dyspnea
13.	Quality of life	Age Socioeconomic status Disease severity Functional status Dyspnea Depression Anxiety Self-esteem Optimism Social support

CHAPTER 4

Results

Descriptive Statistics

Results and descriptive statistics for each of the major study variables are shown in Table 4-1. As can be seen from the table, scores on most measures fell across a broad range of possible scores, indicating variability in the sample and subjects' use of the full range of responses. Of note is the fact that scores on the depression and anxiety inventories fell in the lower one half of the possible range, a somewhat narrower distribution than scores on most of the other psychosocial measures. However, the range of depression and anxiety scores was sufficient to assure that correlations with other variables would not be attenuated.

Zero-Order Correlations

The matrix of Pearson's correlations among variables is shown in Table 4-2. The dependent variable, quality of life, had a significant zero-order correlation with each of the other study variables except socioeconomic status, the largest of these being with self-esteem ($r = .639$, $p < .001$) and depression ($r = -.581$, $p < .001$). The psychosocial variables were significantly correlated with one another, with the exception of anxiety and social support ($r = -.129$, $p = .151$). Although there were moderately large correlations between some pairs of variables (e.g., r =

Table 4-1

Descriptive Statistics for Major Study Variables

Variable	Mean	Median	Standard Deviation	Possible Range	Minimum Score	Maximum Score
Age (years)	68.12	68.00	7.42	>40	48	85
Socioeconomic status	38.21	36.50	11.70	8-66	19	66
Disease severity (FEV_1%)	39.52	38.00	14.49	0-70[a]	12	70
Functional status (6-minute walk; meters)	288.37	301.68	105.93		32.93	500.00
Dyspnea	55.21	58.25	23.60	0-100	2	100
Depression	11.02	11	6.31	0-63	0	29
Anxiety	13.68	12	8.43	0-63	0	37
Self-esteem	28.98	29	3.88	10-40	18	40
Optimism	20.34	21	4.02	0-32	11	32
Social support	134.79	138	18.85	25-175	70	172
Quality of life	81.98	82	10.09	16-112	56	101

Note. N = 126 for each variable.

[a] A value for $FEV_1\% \leq 10\%$ is theoretically possible but clinically unlikely. Although in theory there is no upper limit for the FEV_1%, the upper limit of 70 here reflects the inclusion criteria for the study (i.e., $FEV_1\% \leq 70\%$).

Table 4-2
Correlation Matrix for Major Study Variables[a]

		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
X_{11}	Quality of life	**.234**[b]	.110	**-.317**	**-.182**	**.257**	**-.581**	**-.368**	**.639**	**.415**	**.474**
X_1	Age		-.025	-.138	-.003	**-.212**	-.107	-.094	.126	.087	.036
X_2	Socioeconomic status			.040	.043	.147	-.101	-.110	**.204**	.161	.172
X_3	Disease severity				**.242**	**-.324**	**.243**	.130	**-.375**	**-.352**	**-.264**
X_4	Dyspnea					**-.198**	**.335**	**.359**	**-.222**	-.049	-.166
X_5	Functional status						**-.313**	**-.290**	**.348**	**.245**	**.271**
X_6	Depression							**.655**	**-.604**	**-.448**	**-.388**
X_7	Anxiety								**-.421**	**-.210**	-.129
X_8	Self-esteem									**.604**	**.440**
X_9	Optimism										**.500**
X_{10}	Social support										

Note. N = 126 for all correlations.

[a] Pearson's r.

[b] **Bold** indicates $p < .05$.

.655, for depression and anxiety), none of these were large enough to cause concern about adverse effects of multicollinearity in the regression analyses. According to Tabachnick and Fidell (1989), zero-order correlations greater than .70 cause theoretical problems, and correlations greater than .90 cause statistical problems in regression analysis. In this study, none of the correlations exceeded these critical values.

Results of the Path Analysis

Path analysis decomposes the total covariance between predictors and dependent variables into its constituent parts: direct, indirect, and non-causal effects. The total covariance is equal to the zero-order correlation between predictor and dependent variable. Direct effects are those between independent and dependent variables not mediated by any intervening variables, that is, one variable causes the other directly. Indirect effects occur when one variable changes another indirectly by way of one or more other variables (Duffy, Watt, & Duffy, 1981). The sum of direct and indirect effects is often called the total effect, somewhat of a misnomer since it does not include non-causal effects in its calculation.

Non-causal effects are those that occur because of a spurious or unanalyzed relationship between the independent and dependent variables (Duffy et al., 1981). Spurious relationships between two variables occur when the variables have an association attributable to the relationship of each to a third variable. Unanalyzed effects are effects due to variables not included in the theoretical model (Pedhazur, 1982).

In path analysis, a series of regression equations designates successive variables as dependent, and each dependent variable is regressed on the variables it is hypothesized to depend upon (Pedhazur, 1982). In this study, the standardized regression coefficients (βs) represented the path coefficients for the relationship between a particular dependent variable and its predictor variables. Standardized regression coefficients were used to represent the path coefficients so that the relative effects of variables in the model could be compared. The unstandardized coefficients are also reported so that readers wishing to make comparisons of these results to other populations may do so (Pedhazur, 1982).

As discussed in Chapter 3 and shown in Table 3-4, thirteen regression analyses were performed to test the theoretical model. Table 4-3 shows the results of the regression equations. The standardized regression coefficients (βs) from Step 13 represent direct effects of the predictor variables on quality of life. The total effect of each predictor on quality of life is its standardized regression coefficient from the first equation in which it appears in Steps 10 through 13. For example,

Table 4-3
Regression Coefficients and Significance Levels for Thirteen Regression Analyses

Variables	Hypothesized Direct Effects[a]	B(S.E.)[b]	β[c]	F-to-Remove[d,e]	p[f]	R^2 [g]
Step 1						
Dependent						
Socioeconomic status						.00
Independent						
Age	-	-.039 (.142)	-.025	.076	.783	
Step 2						
Dependent						
Disease severity						.02
Independent						
Age	+	-.268 (.174)	-.137	2.358	.127	
Socioeconomic status	none	.045 (.111)	.036	.165	.685	

[a] Direct effects hypothesized by theoretical model of quality of life in COPD.
[b] Unstandardized regression coefficient and its standard error.
[c] Standardized regression coefficient ($\beta = B \times S.D._{I.V.} / S.D._{D.V.}$ where I.V. is the independent variable and D.V. is the dependent variable).
[d] Squared *t* statistic, where $t = B/S.E._B$.
[e] Degrees of freedom for each *F* = k, N - k - 1, where k is the number of independent variables and N = 126.
[f] *p* values are rounded to three decimal places. Therefore, in this table, p = .001 represents a *p* value rounded to .001, and p = .000 represents p < .001.
[g] Proportion of variance explained in the dependent variable by the independent variables.

Table continues on next page.

Table 4-3 (Continued)
Regression Coefficients and Significance Levels for Thirteen Regression Analyses

Variables	Hypothesized Direct Effects	B(S.E.)	β	F-to-Remove	p	R^2
<u>Step 3</u>						
Dependent						
Dyspnea						.06
Independent						
Age	none	.099 (.282)	.031	.124	.725	
Socioeconomic status	none	.070 (.177)	.034	.154	.696	
Disease severity	+	.399 (.144)	.245	7.621	.007	
<u>Step 4</u>						
Dependent						
Functional status						.21
Independent						
Age	-	-3.631(1.166)	-.254	9.707	.002	
Socioeconomic status	none	1.442 (.733)	.159	3.872	.051	
Disease severity	-	-2.448 (.615)	-.335	15.841	.000	
Dyspnea	-	-.560 (.374)	-.125	2.239	.137	

Table continues on next page.

Table 4-3 (Continued)
Regression Coefficients and Significance Levels for Thirteen Regression Analyses

Variables	Hypothesized Direct Effects	B(S.E.)	β	F-to-Remove	p	R^2
<u>Step 5</u>						
Dependent						
Depression						.21
Independent						
Age	none	-.129 (.072)	-.151	3.161	.078	
Socioeconomic status	none	-.044 (.044)	-.082	.994	.321	
Disease severity	none	.034 (.039)	.077	.746	.389	
Dyspnea	+	.072 (.023)	.269	10.199	.002	
Functional status	-	-.015 (.005)	-.255	7.823	.006	
<u>Step 6</u>						
Dependent						
Anxiety						.21
Independent						
Age	none	-.180 (.097)	-.158	3.442	.066	
Socioeconomic status	none	-.063 (.060)	-.087	1.116	.293	
Disease severity	none	-.030 (.052)	-.052	.334	.565	
Dyspnea	+	.115 (.030)	.322	14.531	.000	
Functional status	none	-.021 (.007)	-.264	8.331	.005	

Table continues on next page.

Table 4-3 (Continued)
Regression Coefficients and Significance Levels for Thirteen Regression Analyses

Variables	Hypothesized Direct Effects	B(S.E.)	β	F-to-Remove	p	R^2
<u>Step 7</u>						
Dependent						
Self-esteem						.26
Independent						
Age	none	.077 (.043)	.147	3.188	.077	
Socioeconomic status	none	.062 (.026)	.187	5.500	.021	
Disease severity	none	-.068 (.023)	-.254	8.542	.004	
Dyspnea	none	-.020 (.013)	-.119	2.137	.146	
Functional status	+	.009 (.003)	.246	7.757	.006	
<u>Step 8</u>						
Dependent						
Optimism						.18
Independent						
Age	none	.043 (.047)	.079	.826	.365	
Socioeconomic status	none	.052 (.029)	.151	3.190	.077	
Disease severity	none	-.086 (.026)	-.311	11.437	.001	
Dyspnea	-	.009 (.015)	.050	.332	.566	
Functional status	+	.006 (.004)	.149	2.558	.112	

Table continues on next page.

Table 4-3 (Continued)

Regression Coefficients and Significance Levels for Thirteen Regression Analyses

Variables	Hypothesized Direct Effects	B(S.E.)	β	F-to-Remove	p	R^2
<u>Step 9</u>						
Dependent						
Social support						.14
Independent						
Age	none	.134 (.226)	.053	.352	.554	
Socioeconomic status	+	.254 (.139)	.158	3.349	.070	
Disease severity	none	-.236 (.122)	-.181	3.748	.055	
Dyspnea	none	-.074 (.070)	-.092	1.101	.296	
Functional status	none	.032 (.017)	.182	3.655	.058	
<u>Step 10</u>						
Dependent						
Quality of life						.07
Independent						
Age	none	.322 (.118)	.237	7.380	.008	
Socioeconomic status	none	.100 (.075)	.116	1.762	.187	

Table continues on next page.

Table 4-3 (Continued)
Regression Coefficients and Significance Levels for Thirteen Regression Analyses

Variables	Hypothesized Direct Effects	B(S.E.)	β	F-to-Remove	p	R^2
<u>Step 11</u>						
Dependent						
Quality of life						.15
Independent						
Age	none	.267 (.114)	.196	5.435	.021	
Socioeconomic status	none	.109 (.072)	.126	2.292	.133	
Disease severity	none	-.205 (.059)	-.295	12.246	.001	
<u>Step 12</u>						
Dependent						
Quality of life						.20
Independent						
Age	none	.347 (.116)	.255	8.884	.004	
Socioeconomic status	none	.083 (.071)	.096	1.346	.248	
Disease severity	none	-.134 (.063)	-.192	4.539	.035	
Dyspnea	none	-.041 (.036)	-.096	1.288	.259	
Functional status	none	.021 (.009)	.216	5.550	.020	

Table continues on next page.

Table 4-3 (Continued)
Regression Coefficients and Significance Levels for Thirteen Regression Analyses

Variables	Hypothesized Direct Effects	B(S.E.)	β	F-to-Remove	p	R^2
<u>Step 13</u>						
Dependent						
Quality of life						.53
Independent						
Age	none	.204 (.093)	.150	4.767	.031	
Socioeconomic status	none	-.019 (.058)	-.022	.109	.742	
Disease severity	none	-.041 (.053)	-.059	.614	.435	
Dyspnea	none	.022 (.031)	.052	.528	.469	
Functional status	none	.002 (.007)	.020	.070	.792	
Depression	-	-.444 (.162)	-.278	7.501	.007	
Anxiety	-	-.005 (.108)	-.004	.002	.962	
Self-esteem	+	1.026 (.248)	.395	17.083	.000	
Optimism	+	-.235 (.221)	-.094	1.134	.289	
Social support	+	.120 (.042)	.225	8.155	.005	

the total effect of socioeconomic status on quality of life equals .116, the standardized regression coefficient from Step 10. The total effect of dyspnea on quality of life equals -.096, the standardized regression coefficient from Step 12.

Direct effects are equal to total effects for the five mediating variables because there were no intervening variables between the mediators and quality of life. For the antecedent variables, indirect effects were calculated by subtracting direct from total effects. Values for non-causal effects were obtained by subtracting total effects from the total covariance (i.e., the zero-order correlation) between predictors and quality of life. Direct, indirect, total, and non-causal effects are summarized in Table 4-4.

Results in Relation to the Study Hypotheses

As shown in Step 13 of Table 4-3, the theoretical model explained 53% of the total variance in quality of life in COPD (multiple $R = .73$, $R^2 = .53$, adjusted $R^2 = .49$, $F_{10,115} = 12.947$, $p < .001$). The decomposition of effects as hypothesized by the model is described in detail below.

Direct effects. The two major study hypotheses were partially supported. The hypothesis that none of the antecedent variables would have a direct effect on life quality was supported with the exception of the finding of a

Table 4-4
Decomposition of Total Covariance Between Predictor Variables and Quality of Life

	A	B	C	D	E
Bivariate Relationship	Total Covariance[a]	Direct Effects[b]	Indirect Effects	Total Effects (D=B+C)	Non-causal Effects (E=A-D)
$X_{11}X_1$	.234	**.150**[c]	.087	**.237**	-.003
$X_{11}X_2$	.110	-.022	.138	.116	-.006
$X_{11}X_3$	-.317	-.059	-.236	**-.295**	-.022
$X_{11}X_4$	-.182	.052	-.148	-.096	-.086
$X_{11}X_5$	.257	.020	.196	**.216**	.041
$X_{11}X_6$	-.581	**-.278**	--	**-.278**	-.303
$X_{11}X_7$	-.368	-.004	--	-.004	-.364
$X_{11}X_8$	.639	**.395**	--	**.395**	.244
$X_{11}X_9$	.415	-.094	--	-.094	.509
$X_{11}X_{10}$	.474	**.225**	--	**.225**	.249

Note. X_1 = age; X_2 = socioeconomic status; X_3 = disease severity; X_4 = dyspnea; X_5 = functional status; X_6 = depression; X7 = anxiety; X_8 = self-esteem; X_9 = optimism; X_{10} = social support; X_{11} = quality of life.

[a] Zero-order correlation between predictor and quality of life.

[b] Standardized regression coefficient (β) from last step in regression analysis.

[c] Bold indicates $p < .05$.

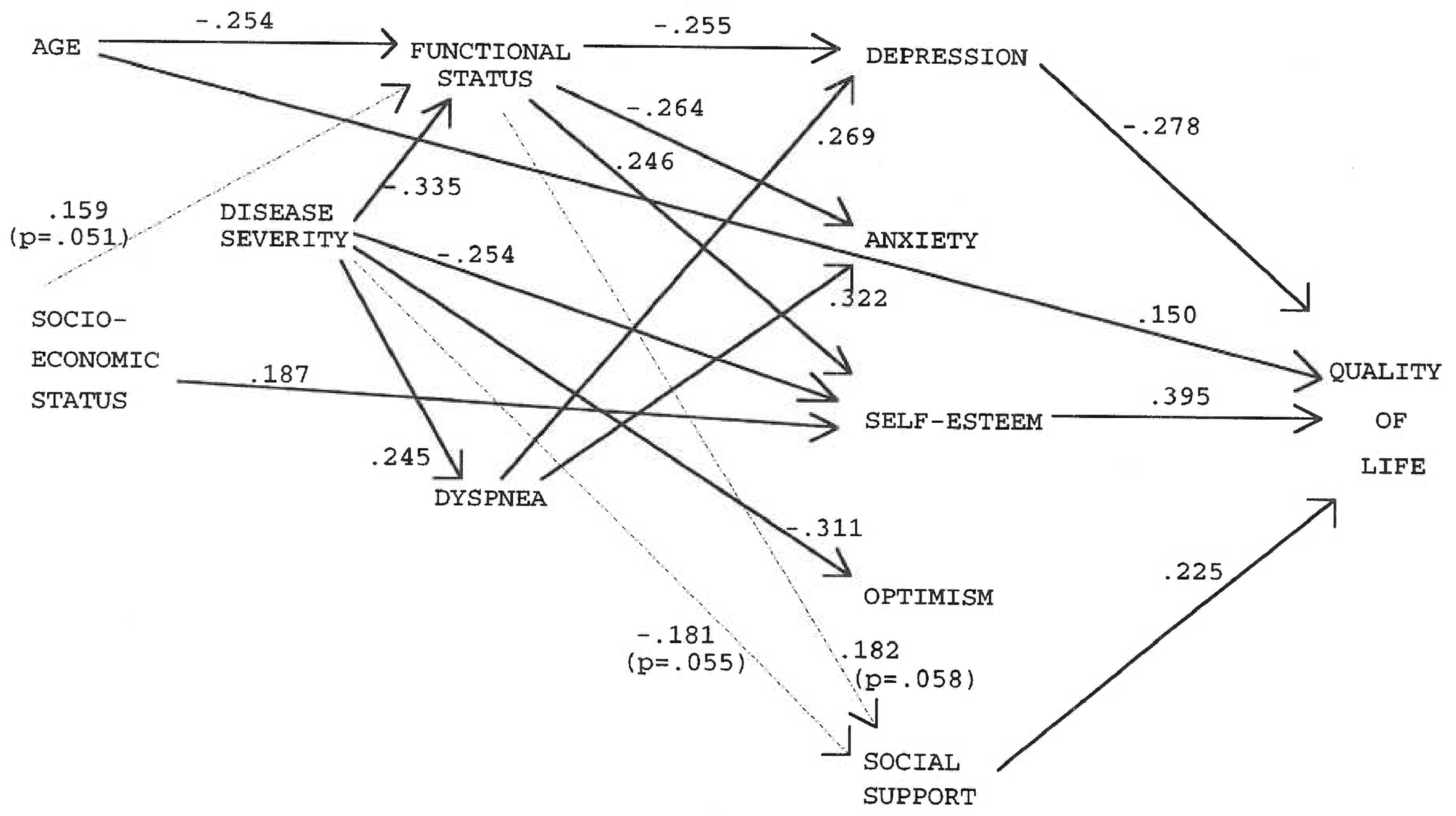
direct effect of age on quality of life. Whereas the proposed model hypothesized that all of the mediating variables would have direct effects on quality of life, two mediators, anxiety and optimism, did not.

Although some of the other hypothesized relationships between variables were supported by the data, others were not. In addition, several significant relationships were found that had not been predicted by the model. All of these relationships are described below. Standardized path coefficients that reached statistical significance ($p < .05$) are shown in Figure 4-1.

As predicted, increasing age was associated with a decline in functional status ($\beta = -.254$, $p = .002$). However, contrary to predictions, age did not have a significant relationship with socioeconomic status ($\beta = -.025$, $p = .783$) or disease severity ($\beta = -.137$, $p = .127$). As noted above, age did have a significant, though small ($\beta = .150$, $p = .031$), direct effect on quality of life, a relationship not hypothesized by the model.

The quality of life model hypothesized a positive effect of socioeconomic status on social support. However, this relationship was not supported by the data ($\beta = .158$, $p = .070$). Instead, a significant relationship was found between socioeconomic status and self-esteem ($\beta = .187$, $p = .021$). In addition, the relationship between socioeconomic status and functional status very nearly reached

FIGURE 4-1
SIGNIFICANT PATH COEFFICIENTS FOR QUALITY OF LIFE MODEL



Note: $p < .05$ unless otherwise indicated significance ($\beta = .159$, $p = .051$).

As hypothesized, disease severity was an important predictor of both functional status ($\beta = -.335$, $p < .001$) and dyspnea ($\beta = .245$, $p = .007$). In addition, disease severity had direct effects on self-esteem ($\beta = -.254$, $p = .004$) and optimism ($\beta = -.311$, $p = .001$). The relationship between disease severity and social support nearly reached significance ($\beta = -.181$, $p = .055$). None of the latter three relationships was hypothesized by the proposed model.

Contrary to the study hypotheses, dyspnea did not predict functional status ($\beta = -.125$, $p = .137$) or optimism ($\beta = .050$, $p = .566$). However, the hypotheses that dyspnea would have positive relationships with depression ($\beta = .269$, $p = .002$) and anxiety ($\beta = .322$, $p < .001$) were supported.

Functional status had a direct negative effect on depression ($\beta = -.255$, $p = .006$) and a direct positive effect on self-esteem ($\beta = .246$, $p = .006$), as hypothesized by the model. Functional status also had a direct negative effect on anxiety ($\beta = -.264$, $p = .005$), a relationship that had not been predicted. Another relationship that was not predicted but nearly reached significance was a positive effect of functional status on social support ($\beta = .182$, $p = .058$). Functional status had no direct effect on optimism ($\beta = .149$, $p = .112$), contrary to the prediction for this relationship.

As noted above, the hypothesized direct relationships between quality of life and depression ($\beta = -.278$, $p = .007$), self-esteem ($\beta = .395$, $p < .001$), and social support ($\beta = .225$, $p = .005$) were supported by the data. However, contrary to predictions, neither anxiety ($\beta = -.004$, $p = .962$) nor optimism ($\beta = -.094$, $p = .289$) were significant predictors of quality of life. The latter two relationships remained small or statistically insignificant even when alternative specifications of the model were tested that omitted variables with which anxiety and optimism had significant zero-order correlations (i.e., depression and self-esteem, respectively).

Indirect effects. As expected, age had an indirect effect on quality of life through functional status and depression, and through functional status and self-esteem. Although socioeconomic status had been predicted to affect quality of life indirectly through social support, it in fact exerted its indirect effect through self-esteem.

Several indirect paths were found between disease severity and quality of life. Predicted paths that were supported by the data lay through functional status and depression, through functional status and self-esteem, and through dyspnea and depression. An additional path was found between disease severity and quality of life through social support, although the path between disease severity and social support did not quite reach significance (see above).

Functional status had a negative indirect effect on quality of life through depression, and a positive indirect effect through self-esteem. A positive indirect effect was also found between functional status and quality of life through social support, although the relationship between functional status and social support did not reach the .05 criterion for significance (see above).

As predicted, dyspnea had an indirect effect on quality of life through depression. However, the hypothesized paths between dyspnea and quality of life through anxiety and optimism were not supported by the data.

Total effects. As stated earlier, direct effects are equal to the total effects of the mediating variables on quality of life. Therefore, the three mediating variables with significant direct effects (i.e., depression, self-esteem, and social support) had significant total effects on quality of life. In addition, age was found to have a significant direct effect on quality of life, and its total effect was also significant. Two additional antecedent variables had significant total, though indirect, effects on quality of life. The total effect of disease severity on quality of life was significant and negative ($\beta = -.295$, $p = .001$). Functional status had a significant positive total effect on quality of life ($\beta = .216$, $p = .020$).

CHAPTER 5

Discussion and Conclusions

In the first part of this chapter, the results of the current investigation will be discussed in their unique context as well as in relation to findings from previous research. Next, the limitations of the study will be described, and the implications of the study findings for theory, practice, and future research will be discussed. The chapter will conclude with a brief summary of the investigation.

Meaning of Results

Major Study Variables

Demographic variables. The mean age of subjects participating in this study was 68.12 (S.D. = 7.42) years, with 87% of subjects 60 years of age or over. This age distribution is similar to that found in other studies of quality of life and functional status in COPD that used inclusion criteria similar to those used here. However, these subjects were older than subjects in studies using a severity of illness criterion less strict than the one specified in this study (see Table 5-1).

The age distribution in this sample is a reflection of who is afflicted with COPD in the United States. Although COPD has always been most prevalent among older people because of its long latency period, death rates from COPD in people over age 65 have increased dramatically in the past

TABLE 5-1
Age and Disease Severity Data in Studies of Quality of Life and Functional Status in COPD

Study	Age Mean (S.D.)	Age Range	Disease Severity[a]	Eligibility Criteria
Brown et al., (1981)	58.75(7.22)	--[b]	--	age <68 yrs.; community resiident; no other chronic illness; treated for at least 9 mos.
Dardes et al., (1990)	--	55 - 73	--	diagnosis of chronic bronchitis with chronic respiratory failure
Hanson (1982)	--	"young adult - eighth decade"	--	outpatients with COPD
Jensen (1983)	64	--	--	diagnosis of COPD; no other diagnosis precluding participation in treatment
Leidy (1990)	65.21(8.46)	40 - 84	FEV_1% mean = 43.3%; S.D. = 18.88.	Not reported.

[a] Disease severity as measured by pulmonary function testing.
[b] (--) denotes data not reported.

Table continues on next page.

TABLE 5-1 (Continued)
Age and Disease Severity Data in Studies of Quality of Life and Functional Status in COPD

Study	Age Mean (S.D.)	Age Range	Disease Severity	Eligibility Criteria
Lee et al. (1991)	68.53(--)	--	$FEV_1\%$ mean = 26; S.D. = 6.88; range = 13-39%	$FEV_1\%$ < 40; oxygen use >8 hr/day
McSweeny et al., (1982)	65.5(8.3)	--	FEV_1 mean = .75 liters; S.D. = .35 L	diagnosis of COPD; PaO_2 < 60 mm Hg;
Moody et al., (1990, 1991)	--	40 - 80 45% > 60 yrs. of age	FEV_1/FVC mean = 66.41; S.D. 14.26%	diagnosis of COPD; literate; "coherent"
Prigatano et al., (1984)	60.9(7.8)	--	FEV_1 mean = 1.02 L; $FEV_1\%$ mean = 36.1%; S.D. = 11.3%	diagnosis of COPD; age 30-74; ambulatory; $FEV_1\%$ < 60%; resting PaO_2 > 54 mm Hg.
Schrier et al., (1990)	61.8(12.9)	40 - 84	FEV_1 mean = 1.86 L; S.D. .89 L; $FEV_1\%$ mean = 70.4; S.D. = 27.2	diagnosis of CNSLD; excluded if diagnosed with other chronic diseases, or participation too burdensome.

Table continues on next page.

TABLE 5-1 (Continued)
Age and Disease Severity Data in Studies of Quality of Life and Functional Status in COPD

Study	Age Mean (S.D.)	Age Range	Disease Severity	Eligibility Criteria
Sexton & Munro (1988)	59.8(12.6)	--	--	diagnosis of COPD
Traver (1988)	70.8(8.5)	--	FEV_1 mean = .73 L; S.D. .317 L; FEV_1% mean = 29.8%; S.D. = 13.2%	diagnosis of COPD; FEV_1 < 1.5 L and < 60% of predicted; no other medical or psychiatric illness
Weaver & Narsavage (1992)	65.5(7.72)	40 - 84	FEV_1 mean = 1.61; S.D. = .814	diagnosis of COPD; age 40-85; stable; no blindness or drug treatment for psychiatric disease

several years (Edelman et al., 1992). Edelman et al. (1992) hypothesize that this increase may be due to a decline in death rates from cardiovascular disease and the stabilization of non-respiratory cancer death rates, so that current and former smokers live long enough to suffer and die from COPD.

With regard to socioeconomic status, direct comparisons of the study subjects with other samples is difficult because of the use of different indicators to assess this variable across studies. Level of education, a frequently used measure of socioeconomic status, is somewhat easier to compare across samples, although research reports have not always provided the data necessary for this comparison. The modal level of educational achievement in the current sample was high school graduation, with 71.44% of subjects completing 12 or more years of schooling. In contrast, subjects in other studies had an average of 9.6 (McSweeny et al., 1982) and 10.7 (Prigatano et al., 1984) years of education. Forty-eight percent of the subjects in Weaver and Narsavage's (1992) sample had less than a high school education.

Based on the distribution of scores on the Four Factor Index of Social Status (Hollingshead, 1975), subjects in this sample occupied a wide range of social strata. The mean score on the Index was 38.21 (S.D. = 11.7) out of a possible 66. The distribution had a slightly positive skew (skewness = .47), indicating fewer people in the upper strata, but the majority of the subjects were solidly middle class.

One explanation for the somewhat higher mean level of socioeconomic status in this sample as compared to others is the source of subjects, that is, a private medical office. Although the office accepted all patients referred to it, including those without insurance or on public assistance, it is likely that many such patients obtain their medical care at public institutions such as veterans' facilities. Therefore, while retired military personnel made up a significant portion of the sample, many of these may also have been people who could afford private insurance in addition to their veterans benefits. In contrast, many studies of COPD have been conducted at Department of Veterans' Affairs facilities, in which the proportion of patients from lower socioeconomic strata may be greater.

Disease variables. Subjects in this study had a degree of airflow obstruction ranging from moderate to very severe as measured by simple spirometry (ATS, 1991). $FEV_1\%$ in the sample ranged from 12% to 70%, with a mean of 39.21% (S.D. = 14.49). Complete data on expiratory flow rates in this sample are shown in Table 5-2.

The upper limit of function ($FEV_1\%$ 70% or less) was deliberately selected in this study so as to obtain subjects with significant and symptomatic disease while covering the

Table 5-2
Pulmonary Function Data for Study Subjects

Pulmonary Function Test[a]	Mean	Median	Standard Deviation	Minimum Score	Maximum Score
FVC (liters)	2.43	2.35	.78	.87	4.53
FEV_1 (liters)	1.02	.93	.45	.30	2.65
FEV_1/FVC (%)	41.82	42.02	11.91	.27	69.65
FVC% (% predicted)	74.20	75.00	17.50	35.00	135.00
FEV_1% (% predicted)	39.52	38.00	14.49	12.00	70.00
FEV_1/FVC% (% pred.)	53.23	52.50	1.28	21.00	87.00

Note. N = 126 for each test except FEV_1/FVC, where n = 125.
[a] FVC = forced vital capacity; FEV_1 = forced expiratory volume in the first one second of the FVC; FEV_1/FVC = the ratio between FEV_1 and FVC; FVC%, FEV_1%, and FEV_1/FVC% = each of the above compared to the value predicted for an individual based on age, gender, and height.

broadest possible range of pulmonary function. Moderately severe obstruction is judged to be present when the FEV_1% falls below 70% of predicted (ATS, 1991). Most people become limited in work and daily living activities when their FEV_1% reaches 35% to 40%, and mortality increases once FEV_1% falls below 25% (Edelman et al., 1992).

Owing to its breadth, the range of function in this study overlaps with that found in most other studies, some of which sought only the most severely ill (e.g., Lee et al., 1991; McSweeny et al., 1982), and some of which selected for less severe disease (e.g., Prigatano et al., 1984). A comparison of disease severity across relevant studies can be made from Tables 5-1 and 5-2.

Previous research reports using the Dyspnea Visual Analogue Scale (DVAS) in large samples of stable COPD patients were not found in the literature. However, like the other disease and demographic variables, the range of dyspnea scores in this sample was broad and the distribution normal, as would be expected for a subjective sensation such as dyspnea. Scores ranged from 2 to 100 (possible range 0 to 100), with a mean of 55.21 (S.D. = 23.60).

A comparison of 6-minute walk distances in COPD patients in this and other studies is shown in Table 5-3. From the table, it can be seen that with the exception of the patients studied by Johnson et al. (1983), mean walk

Table 5-3
Comparison of 6-Minute Walk Test Results in Six Studies of Patients with COPD

Study	N	Age (years) mean (S.D.)	FEV_1 (liters) mean (S.D.)	Distance Walked (meters) mean (S.D.)
Anderson (1993)	126	68.1(7.4)	1.02(.45)	288(106)
Butland et al., (1982)	30[a]	61(12)	1.28(.66)	413(107)[b]
Davidson et al., (1988)	17	64.4(2.1)	.79(.03)	284(31) 336(105)[b,c]
Guyatt, Berman, & Townsend (1987)	31	64.6(4.1)	1.10(.45)	322(102)[b]
Johnson et al., (1983)	15	58.9(--)[d]	.59(.14)	343(116)[b]
	11[e]	57.5(--)	.62(.14)	289(104)
Jones et al., (1989)	141	63(--)	--[f]	--[f]

[a] Subjects with "stable chronic respiratory disability owing to various diseases" (Butland et al., 1982, p. 1607).

[b] At least one practice walk conducted before 6-minute walk test.

[c] Subjects walked with and without supplemental oxygen. Line 1 = distance walked on room air; line 2 = distance walked with oxygen at 4 liters per minute.

[d] (--) = data not reported.

[e] Data for two diagnostic groups were reported separately. Line 1 = emphysema; line 2 = chronic bronchitis.

[f] Median values for FEV_1 and distance walked were reported. Median FEV_1 in the sample = 1.1 liters; median distance walked = 394 meters.

distances were greater in the other samples than for subjects in this study. However, most of the samples were small, and patients in other studies were younger than those in the current study. Subjects studied by Guyatt, Berman, and Townsend (1987) were selected because of their motivation and good rehabilitation potential, which may have biased the results toward greater walking distances. In addition, most (but not all) of these investigators included a practice walk in their protocols, a procedure that has been shown to increase the distance walked in subsequent tests. Subjects in the current study did not perform a practice walk (see Chapter 3).

Mediating variables. As was discussed in the review of the literature, COPD patients have often been found to be depressed (Agle et al., 1973; Light et al., 1985; McSweeny et al., 1982; Prigatano et al., 1984) and anxious (Agle et al., 1973; Prigatano et al., 1984). The results of this study are in partial agreement with those of earlier work, but some interesting departures from previous findings were also found.

McSweeny et al. (1982) and Light et al. (1985) found that 42% of their subjects were depressed. Sixteen of 21 patients were judged to be depressed according to psychiatric symptoms in the study by Agle et al. (1973); MMPI scores were also obtained, but not reported, for this sample. Only Light et al. (1985) used the Beck Depression

Inventory (BDI) to assess depression, and they used a cut-off score of 15 to indicate significant depression. The mean depression score for their 45 male veterans with moderate to severe COPD was 15 (S.D. not given), with 19 subjects scoring higher than 15.

In comparison, the mean BDI score in this investigation was 11 (S.D. = 6.3). Using the criterion of 15 to indicate significant depression, 28 patients (22%) would have been classified as depressed. However, this study had specified an *a priori* BDI score greater than 18 as indicative of significant depression, in accordance with the recommendations of Beck, Steer, and Garbin (1988) for a cut-off score for moderate to severe depression. Using this criterion, 14 subjects (11%) in this sample were significantly depressed.

Apart from measurement issues, the sample in this study differed from that of others in whom significant depression was found in some important ways that might help to explain the differences in prevalence of depression across studies. One such difference is gender, although BDI scores have been inconsistently linked to this variable in previous research (Beck, Steer, & Garbin, 1988). Both Agle et al. (1973) and Light et al. (1985) studied veterans, all of whom presumably were male (although the former study did not report the gender of its subjects). Seventy-nine percent of subjects were male in the study by McSweeny et al. (1982). In contrast, 55% of subjects in the current study were female. However, the correlation between gender and BDI score in this sample was not significant (r = .018, p = .846), indicating a lack of support for gender differences in explaining the smaller number of depressed subjects in this study.

A second possible difference between samples was the socioeconomic status of participants. As suggested earlier, subjects in the current sample may have been from a somewhat higher socioeconomic group than those in other studies. The inclusion of large numbers of veterans in other studies, who may be from lower socioeconomic levels than private patients, may have influenced the rates of depression in these samples. Beck, Steer, and Garbin (1988) noted that BDI scores have been found to be inversely related to educational achievement. However, as with gender, no such relationship was found between education or socioeconomic status and BDI score in this sample (r = -.041, p = .651, and r = -.10, p = .260, respectively).

Another possible explanation for the lower prevalence of depression in this study as compared to others is that subjects were not excluded from the current study if they were taking anti-depressant medications. Thus, some subjects who had been depressed could have experienced a reduction in symptoms due to medication, and had lower BDI scores as a result. As in the current study, neither the

NOTT (McSweeny et al., 1982; NOTT Group, 1980) nor Agle et al. (1973) excluded subjects based on use of anti-depressant medications. In contrast, Light et al. (1985) did exclude patients who had taken tricyclic anti-depressants or other major anti-psychotic drugs in the two months prior to their study. Given that all of these studies found high rates of depression while using different exclusion criteria with respect to anti-depressant medications, it is difficult to conclude that use of such medication accounts for the lower rate of depression in the current study.

Finally, using the NOTT and IPPB data, Labuhn (1984) found that depressed mood was inversely related to perceived illness dysfunction, or the degree to which a person was limited in his or her ability to carry out everyday activities. Perceived illness dysfunction, in turn, was partly determined by disease severity. Based on her findings, it would be expected that sicker subjects would be more depressed. Unfortunately, Agle et al. (1973) did not report any disease severity data, so that this possibility could not be evaluated for their subjects. However, Light et al. (1985) selected for severe airflow obstruction, so that the high rate of depression found in their study provided support for Labuhn's (1984) findings. The current study included subjects with a broad range of disease severity, and higher levels of depression were associated with increased disease severity ($r = .243$, $p = .006$).

Therefore, it seems possible that the lower rate of depression in this study may have been attributable in part to a greater range of disease severity than that found in studies looking only at the high end of the severity spectrum.

The mean score on the Beck Anxiety Inventory in the study sample was 13.68 (S.D. = 8.43). Although this instrument has not been used in previous research with COPD patients, comparison data are available from both normal and clinical psychiatric populations.

In psychometric testing of the BAI, Borden, Peterson, and Jackson (1991) found a mean score of 10.75 (S.D. = 9.12) in 293 undergraduates. Women had higher scores than men, with mean scores of 12.00 (S.D. = 9.35) and 7.09 (S.D. = 6.94), respectively. Reynolds and Salkovskis (1991) found a mean score of 9.38 (S.D. = 7.22) on the BAI in a sample of 169 normal adults aged 17 to 50. Hermann, Seidenberg, Haltiner, and Wyler (1991) administered the BAI to two groups of adults with unilateral temporal lobe epilepsy (TLE). Subjects with right TLE had a mean score of 9.1 (S.D. = 7.1), and subjects with left TLE had a mean score of 10.5 (S.D. = 8.5). The difference between the two groups was not statistically significant.

In studying the ability of the BAI to discriminate among diagnostic groups (i.e., pure anxiety versus pure depression, primary anxiety versus primary depression, and pure or primary anxiety versus pure depression), Beck, Epstein et al. (1988) found mean scores of 24.59 (S.D. = 11.41) to 25.76 (S.D. = 11.42) in subjects with either pure or primary anxiety. Subjects with pure or primary depression had mean BAI scores of 13.27 (S.D. = 8.36) and 18.84 (S.D. = 11.81), respectively.

Comparing the mean scores in both clinical and non-clinical populations with those from the present study, COPD patients' mean scores were considerably lower than those of the anxious psychiatric patients, and slightly higher than those of the three non-clinical groups. In fact, the COPD scores are very similar to those obtained in the pure depression group studied by Beck, Epstein et al. (1988). Along with the high correlation between depression and anxiety in the COPD patients (see below), this finding suggests that the two mood states are closely related in this population. Perhaps the "anxiety" commonly associated with COPD is instead primarily a mood of agitated depression. This idea is supported by the finding of a dramatic reduction in symptoms of anxiety in severely ill, depressed COPD patients treated with a tricyclic anti-depressant drug, nortriptyline (Borson et al., 1992). Light et al. (1985) reached a similar conclusion based on the high (r = .81) correlation between depression and anxiety in their study. They suggested that depression and anxiety occur together in COPD patients, but that the degree of depression must be greater than the degree of anxiety in these patients (p. 36).

Light et al. (1985) set a criterion for moderate anxiety as a normal score that was more than two standard deviations from the mean on the State-Trait Anxiety Index; normal scores between one and two standard deviations above the mean were classified as mild anxiety. After converting BAI scores to normal scores and applying Light's criteria to the patients in this study, 14 subjects (11%) would be classified as mildly anxious, and 2 (0.5%) would be classified as moderately anxious.

Using a more liberal criterion to identify those subjects who were anxious, the frequencies with which subjects selected a given response to individual items on the BAI were examined. As shown in Table 5-4, the number of subjects indicating they had been bothered to a moderate or severe extent by symptoms of anxiety over the past week ranged from 0 to 29 (23%), excluding the item "difficulty breathing", which the majority of subjects undoubtedly experienced due to their COPD. The number of subjects indicating they had been bothered "moderately" by symptoms of anxiety other than difficulty breathing ranged from 1 (< 1%) to 29 (23%), with a mean of 13.6 (11%). Those indicating severe symptoms of anxiety (again excluding difficulty breathing) ranged from 0 to 8 (6%), with a mean of 3 (2%). If these item-level frequencies can be

Table 5-4
Item-Level Frequencies for the Beck Anxiety Inventory in the COPD Study Sample

Item	Number of Subjects Selecting Response[a]			
	Not at all	Mildly	Moderately	Severely
Numbness, tingling	74	32	15	5
Feeling hot	57	37	29	3
Wobbliness in legs	52	49	17	8
Unable to relax	56	45	23	2
Fear of the worst happening	77	38	9	2
Dizzy or lightheaded	74	35	14	3
Heart pounding or racing	72	38	14	2
Unsteady	41	61	18	6
Terrified	108	15	2	1
Nervous	44	55	23	4
Feelings of choking	88	32	4	2

Note. N = 126 for each item.
[a] Number of subjects selecting the response to the statement: Indicate how much you have been bothered by each symptom during the past week, including today.

Table continues on next page.

Table 5-4 (Continued)
Item-Level Frequencies for the Beck Anxiety Inventory in the COPD Study Sample

Item	Number of Subjects Selecting Response			
	Not at all	Mildly	Moderately	Severely
Hands trembling	54	48	16	8
Shaky	47	55	19	5
Fear of losing control	86	31	8	1
Difficulty breathing	8	32	55	31
Fear of dying	85	27	11	3
Scared	80	34	11	1
Indigestion, abdominal discomfort	59	48	16	3
Faint	103	22	1	0
Face flushed	92	28	6	0
Sweating	75	34	16	1

taken as an indication of the presence of anxiety in the study subjects, approximately 11% of the subjects would be classified as moderately anxious, and approximately 2% would be classified as severely anxious. These percentages approximate those obtained using normal scores, but the degree of anxiety is greater using the item-level interpretations than it is with the normal scores. The findings are in agreement with those of Kinsman, Yaroush et al. (1983), who found that only 18 of 146 subjects (12%) rated the frequency with which they experienced symptoms of anxiety as "almost always" or "always".

In contrast, 19 of 21 patients in the study by Agle et al. (1973) were judged in a psychiatric interview to have symptoms of overt anxiety prior to participation in a pulmonary rehabilitation program. COPD patients in both the NOTT and IPPB studies were more tense and anxious than controls, although the actual numbers of anxious patients were not reported (McSweeny et al., 1982; Prigatano et al., 1984).

In summary, the prevalence of anxiety in this sample of COPD patients appeared to be low. This finding supports Traver's (1988) contention that the prevailing stereotype of the COPD patient as being anxious and demanding is a false one, and that only some COPD patients are anxious.

As has been found in previous studies, the correlation between depression and anxiety in this sample was moderately strong (r = .655, p < .001). This result is of particular interest since the BAI was developed for the explicit purpose of discriminating between the two mood states, and in early psychometric testing had a correlation of .48 with the BDI. Factor analysis of the two scales resulted in loading of all anxiety and depression symptoms except one on different factors (Beck, Epstein, et al., 1988). However, Reynolds and Salkovskis (1991) obtained a correlation of .63 (p < .0002) between the BAI and BDI in their normal subjects, suggesting that the scales do not differentiate between the two mood states in non-psychiatric populations.

Self-esteem scores in this sample (mean = 28.98, S.D. = 3.88) were similar to those obtained in other studies of older people and in COPD patients. In Ward's (1977) study of 323 community residents over age 60, the mean score of 29.4 (S.D. = 3.07) on the Rosenberg Self-Esteem Scale was essentially the same as that found in the current study.

The COPD patients studied by Weaver and Narsavage (1992) had a slightly higher mean score (32.24; S.D. = 5.42) on the Self-Esteem Scale than the subjects in this study. Although their score was within one standard deviation of that in the current study, and thus could be regarded as essentially the same, it is possible that a real difference existed between the two groups. Such a difference would be expected based on earlier findings by Hunter, Linn, and Harris (1982). They found that poorer health, more daily

Although their score was within one standard deviation of that in the current study, and thus could be regarded as essentially the same, it is possible that a real difference existed between the two groups. Such a difference would be expected based on earlier findings by Hunter, Linn, and Harris (1982). They found that poorer health, more daily pain, and greater disability were characteristics of people with lower self-esteem, while age, income, education, or an intact marriage had no association with self-esteem. In addition, those with low self-esteem reported more somatization, anxiety, and depression, and had a more external locus of control than did those with high self-esteem (Hunter et al., 1982).

Weaver and Narsavage's (1992) subjects had better pulmonary function than the subjects in this study (see Table 5-1). Their functional status was also somewhat better as evidenced by their 12-minute walk distances, although a direct comparison is difficult owing to the use of different measures in the two studies. Therefore, the Weaver and Narsavage (1992) sample would have been expected to have higher self-esteem scores than the subjects in the current study, which was, in fact, the case.

Comparisons of depression scores for the two groups are also difficult because of the use of different measures in the two studies. However, Weaver and Narsavage's (1992) subjects appeared to be only mildly, if at all depressed, were similar in the two studies. Weaver and Narsavage (1992) found a zero-order correlation between the two variables of -.49 ($p < .01$), while in the current study the correlation was -.60 ($p < .001$).

The results for the Life Orientation Test, the measure of dispositional optimism, were similar in this study to previously established norms for the instrument. The mean of 20.34 (S.D. = 4.02) in this sample was only slightly lower than that found in college students (mean = 21.03 and 21.41 for men and women, respectively; Scheier & Carver, 1985) and was nearly identical to that found previously in older adults (mean = 20.74, S.D. = 4.68; Guarnera & Williams, 1987).

Correlations between dispositional optimism and two other psychosocial variables, depression and self-esteem, were similar for college students and the COPD patients in this study. Depression and optimism were moderately strongly correlated ($r = -.49$, $p < .01$) in the college students (Scheier & Carver, 1985) and the COPD patients ($r = -.448$, $p <.001$). Correlations between self-esteem and optimism were also moderately strong ($r = .48$, $p < .01$) in the college students (Scheier & Carver, 1985) and in the COPD patients ($r = .604$, $p < .001$).

This study found lower levels of perceived social support in COPD patients as measured by the Personal Resource Questionnaire (PRQ) Part 2 than did Lee et al.

optimism were also moderately strong ($r = .48$, $p < .01$) in the college students (Scheier & Carver, 1985) and in the COPD patients ($r = .604$, $p = .000$).

This study found lower levels of perceived social support in COPD patients as measured by the Personal Resource Questionnaire (PRQ) Part 2 than did Lee et al. (1991), with mean scores of 134.79 (S.D. = 18.85) and 143.33 (S.D. = 25.13), respectively. As with self-esteem, the difference between the two means is well within one standard deviation, and perhaps too much significance should not be attached to it. However, Weinert (C. Weinert, personal communication, May 11, 1992) reported mean scores ranging from 139 to 149.2 (S.D. ranging from 13.9 to 19.0) in four nursing research studies using the PRQ, indicating that the subjects in this study may indeed have had lower levels of perceived support than other patient samples.

Dimond and Jones (1983) proposed that a variety of individual, physical, personal, and sociocultural resources influence the relationships among social support, stress, and adaptation. Although data for most of these potentially influential variables are lacking for the current study and that of Lee et al. (1991), it is possible to address similarities between the two samples in relation to some of them. Specifically, the two groups can be compared on the variables of age, marital status, and disease severity.

Disease severity, an aspect of physical well-being, differed for the two studies; Lee et al. (1991) studied only severely ill COPD patients, while this investigation included patients with a broad range of disease severity. Both studies found inverse relationships between disease severity and perceived support. Hence, one would expect that the severely ill patients would have had a lower mean score than the sample that included less severely ill patients. The actual findings were in the opposite direction, that is, the more seriously ill sample reported higher levels of perceived support than the broader-based sample in this study.

Other variables that might influence perceived support for which data are available include age and marital status. Subjects in the two studies were very similar in age (see Table 5-1) and marital status: 64.3% of subjects were married or partnered in the current study, compared to 70% in the study by Lee et al. (1991). Therefore, none of the available data appear to be sufficient to explain the differences in perceived social support between the two groups.

<u>Outcome variable</u>. The COPD patients in the current study had a mean score of 81.98 (S.D. = 10.09) on the Quality of Life Scale (QOLS), and the mean item score was 5.1. No published data are available from the current form of the scale with which to make direct comparisons. However, it is possible to compare the current form to the

earlier version by deleting Item 16, independence.

In their psychometric study of the 15-item QOLS, Burckhardt et al. (1989) found mean scores of 78.43 (Time 1 and Time 3) and 78.52 (Time 2) over a 6-week period in four chronic illness groups. People with stable chronic illness (ostomies) had a mean score of 82.3, while those with unstable chronic illness (diabetes) had a mean of 74.1. A second study comparing quality of life in women with a variety of chronic illnesses found a mean QOLS score of 74.2 in women with COPD, compared to 71.5 for fibromyalgia syndrome, 73.7 for diabetes, 77.2 for osteoarthritis, 79.6 for rheumatoid arthritis, 82.3 for ostomies, and 83.2 for well women (Burckhardt, Clark, & Bennett, 1993).

In comparison, the mean score on the 15-item scale in this study was 76.90. This score is approximately the same as that for the total group of ostomy, diabetes, rheumatoid arthritis, and osteoarthritis patients in the psychometric study by Burckhardt et al. (1989), but is higher than the mean score for COPD women in the study comparing chronic illness groups (Burckhardt et al., 1993). One possible explanation for the higher score in this study might be gender, since this sample was approximately 45% male, while Burckhardt et al. (1993) included only females in their sample. However, scores for males and females in this sample did not differ significantly ($\underline{t} = -.275$, $p = .784$).

Another possible explanation for the difference in QOLS scores for the two samples is age, since the mean age in this sample was 68 years, compared to a mean age of 64 years in the study by Burckhardt et al. (1993). The correlation between age and score on the 15-item QOLS was .223 (p = .011) in this study, and age had a direct effect on quality of life in the path analysis. However, since quality of life is influenced by many other variables, it is likely that factors other than age also contributed to the difference in QOLS scores between these two samples.

Study Hypotheses

The major hypotheses in this study were that none of the disease or demographic variables would have direct effects on quality of life, and that all of the mediating variables would have direct effects on quality of life. As noted in Chapter 4, these hypotheses were partially supported by the data. However, contrary to expectations, one demographic variable (age) had a direct effect on life quality, and two of the mediators (optimism and anxiety) did not. These results will be discussed in depth below. First, however, findings for the hypothesized relationships among all the variables in the model that were shown in Figure 2-1 and described in Chapter 2 will be discussed.

Age. The theoretical model of quality of life in COPD hypothesized that as age increased, functional status would decrease. This hypothesis was supported by the data. However, two other predicted associations related to age--a positive one with disease severity and a negative one with socioeconomic status--were not supported by the data.

Given the known rate of decline in pulmonary function with increasing age in normal and diseased lungs (Murray, 1986), and the fact that COPD mortality is increasing most rapidly in people over age 65 (Edelman et al., 1992), the lack of association between age and disease severity in this sample is difficult to explain. One possible explanation is that no association would be expected because age is controlled for in the calculation of $FEV_1\%$. That is, $FEV_1\%$ is calculated by comparing the subject's obtained FEV_1 to that predicted for him or her based, in part, on age. However, when the absolute value for FEV_1 was substituted for $FEV_1\%$ in the regression equation, no association was found between it and age ($\beta = .066$, $p = .467$).

Therefore, other factors that contribute to the development and severity of COPD that were not included in the model must have had greater effects on disease severity than did age. Potential contributors to disease severity in the study sample might have been smoking-related factors (amount of smoking, depth of inhalation, composition of smoke in the brand of cigarettes smoked, and others), exposure to air pollution, childhood infections, hereditary factors, airway hyperresponsiveness, and occupation (Edelman et al., 1992).

With the exception of the presence of two subjects in the sample with a diagnosed genetic basis for disease ($alpha_1$-antitrypsin deficiency), and a self-report estimate of the amount of smoking subjects had done, little is known about how these other factors might have influenced disease severity in the study sample. Since cigarette smoking is the single most important determinant of the development of COPD, it would seem likely that differential exposure to the harmful substances in tobacco smoke would have accounted for some of the variability in disease severity among subjects, over and above the effect of age. However, the correlation between number of pack-years (number of years of smoking times the number of packs smoked per day) of smoking reported by subjects (mean = 65.23, S.D. = 41.70) and disease severity was not significant (r = .075, p = .416). The absence of a relationship between pack-years smoked and disease severity indicates that other factors not measured in the study (see above), were responsible for the variability in disease severity.

Socioeconomic status was expected to decline with increasing age based on findings of previous research in chronic illness (Burckhardt, 1985) and the greater prevalence of poverty in higher age groups (GAO, 1992), but no association between the two variables was found in the study sample. One possible explanation for the lack of association is the distribution of poverty in older people. The poverty rate is highest among those over age 75 and in elderly blacks and Hispanics (GAO, 1992). However, in this study only 29 (22%) subjects were age 75 or older, while 61 subjects (48%) were between 65 and 74 years of age. The majority of subjects were Caucasian (n = 122; 96.8%), with only one African American and one Hispanic person participating in the study. Therefore, the sample consisted largely of middle class whites who may have been less likely to fall below the poverty line in their "young old" years (i.e., ages 65 to 74).

The study setting may have produced a sample that, even in the upper age groups, overall was better off in socioeconomic terms than samples in other studies of chronic illness. Even though all patients were accepted at the clinic regardless of ability to pay, it is likely that people with COPD self-selected their health care providers based on whether they had medical insurance to supplement their Medicare or veterans benefits. Many patients unable to afford supplemental insurance may have received their medical care elsewhere.

The theoretical model hypothesized that age would have only indirect effects on life quality through other antecedent and mediating variables. Contrary to expectations, age had a direct effect on quality of life in this sample. Although Campbell et al. (1976), among others, had found increased life satisfaction with increasing age, this was believed to be an oversimplified view, particularly in the presence of a potentially disabling chronic illness like COPD. However, it may be that living to an advanced age confers a benefit on people's perceptions of the quality of their lives. As Campbell et al. (1976) speculated, people may indeed move into better circumstances as they grow older. Alternatively, they may become better accommodated to their situations, or improve the fit between their needs and the niche they actually occupy in life with increasing age.

Another possible explanation for the relationship between age and quality of life has to do with the other variables hypothesized to fall between these two in the theoretical model. Perhaps too much emphasis was placed on one dimension of life quality (i.e., health), when variables related to other dimensions not included in the model may in fact mediate the relationship between age and quality of life.

Socioeconomic status. The relationship between socioeconomic status and social support was in the hypothesized direction, but it did not reach statistical significance ($p = .070$). This relationship might have attained significance had the sample size been larger.

A significant positive relationship was found between socioeconomic status and self-esteem. A close examination of the concept of self-esteem provides a likely explanation for this relationship.

Self-esteem was defined in this study as how a person feels about him- or herself in the physical, intellectual, moral-ethical, emotional, and social domains. Attitude toward the self in the physical domain is based on body structure and function, appearance, sexuality, wellness-illness state, and even material possessions that represent an extension of the self (e.g., cars, homes, or clothing). Self-appraisal in the social domain is based on a person's roles and relationships within society, and is particularly sensitive to the views and reactions of others. It is also dependent on the individual's own evaluation of his or her effectiveness in society and impact on the environment. This inner self-esteem is based on action, control and power. Power, in turn, comes from resources such as knowledge, skills, income, and status (Taft, 1985).

Based on this conceptualization of two aspects of self-esteem, people in higher socioeconomic strata (that is, those with more material possessions, higher income, more education, and higher status) would be expected to have greater self-esteem. The association found between socioeconomic status and self-esteem in the current study is consistent with this view of the social and physical domains of the concept.

Another interesting relationship not hypothesized in the theoretical model, between socioeconomic status and functional status, nearly reached statistical significance in the study sample (p = .051). Maddox (1987) has discussed the role of social status indicators in explaining functional impairment in 11,000 Social Security recipients. He noted that income adequacy and years of schooling "were associated independently, dramatically, and significantly" (Maddox, 1987, p. 560) with the risk of functional impairment both at the approximate time of retirement and over the subsequent 10 year period. The finding of a positive association between socioeconomic status and functional status in the current study supports these earlier results.

Disease severity. As expected, a significant negative relationship was found between disease severity and functional status. The hypothesized significant positive relationship between disease severity and dyspnea was also supported by the data. Paths not predicted by the model were found between disease severity and self-esteem, optimism, and social support, although this last path did not quite reach statistical significance.

Referring again to the physical domain of self-esteem and its determinants (including body structure and function, appearance, and wellness-illness state; Taft, 1985) discussed above, it follows that self-esteem would decline with increasing airflow obstruction, as was found in the current study. Although it would be expected that this effect would manifest itself through the perception of symptom severity (such as reduced functioning due to fatigue, an indirect path supported by the data), perhaps patients have ways of knowing the objective severity of their lung disease independent of symptoms. Or, it is possible that some other variable mediating this relationship was not included in the model. The latter seems unlikely because the other symptom that would be expected to influence self-perception in COPD is dyspnea, but no path was found between disease severity and self-esteem through dyspnea in this sample.

More difficult to explain is the direct negative effect of disease severity on dispositional optimism. Perhaps the unrelenting downhill progression of the disease functions over time to produce negative outcome expectancies (Scheier & Carver, 1985, 1987).

As with self-esteem, an indirect effect of objective disease severity on optimism through symptoms, rather than a direct effect, would have been expected (and was hypothesized in the theoretical model). Possible reasons for the direct effect are similar to those offered for disease severity and self-esteem above. An alternative explanation would agree with the results of Scheier and Carver (1987), who found that optimism predicted symptom experience in undergraduates, but that the reverse was not true. Perhaps optimism is an intervening variable between objective disease severity and symptoms rather than a variable dependent on objective and subjective disease severity.

The unexpected negative relationship between disease severity and social support, while it did not quite reach statistical significance (p = .055), is nevertheless an interesting one. As with self-esteem and optimism, it would have been expected that the effects of disease severity on social support would be indirect through symptom experience. In fact, an indirect path was found between disease severity and social support through functional status that nearly attained statistical significance (p = .058).

The finding of a direct relationship between disease severity and perceived social support is consistent with the theoretical model of social support proposed by Dimond and Jones (1983). They suggested that environmental resources, including the individual's physical well-being, influence the perceived adequacy of support. Perceived support in turn buffers the effects of stress on adaptation.

Dyspnea. The theoretical model of quality of life in COPD predicted that dyspnea would have positive effects on depression and anxiety, and negative effects on functional status and dispositional optimism. The hypothesized effects on depression and anxiety were supported by the data, but the effects on functional status and optimism were not.

The fact that dyspnea did not predict functional status in this sample is surprising, since this relationship had been strongly supported in previous research (see Chapter 2). For example, Moody et al. (1990) found that dyspnea was the most important predictor of functional status in 45 patients with COPD.

There are some important differences between the sample in the current study and that of Moody et al. (1990, 1991) on some subject characteristics. Mean age in the current study was 68.21, with 87% of participants over age 60. Moody et al. (1990, 1991) did not report the mean age of their subjects. They did report an age range similar to that in the current study, but only 40% of subjects were over age 60. The mean FEV_1/FVC ratio in the current study was 41.82%, versus 66.41% in the subjects studied by Moody et al. (1990, 1991). Mean dyspnea (DVAS) scores in the two groups were 55.21 and 38.11, respectively.

It is possible that the differences between the two samples in terms of the relationship between dyspnea and functional status is based in part on the older age of subjects in this study compared to that of Moody et al. (1990, 1991). The effect of age on functional status was significant in this study, while that of dyspnea was not. Perhaps the effect of greater age relative to dyspnea is more important in the oldest age group than in the late middle age to young old age group.

The comparison between the two samples on objective disease severity is an interesting one. With a mean

FEV_1/FVC ratio of 66.41% in the sample of Moody et al. (1990, 1991), many of their subjects probably did not have significant obstructive disease as defined by the ATS (1991. [In fact, the ATS recommends against using the FEV_1/FVC as the sole measure of disease severity]). The range of both dyspnea and functional status among subjects would likely be much greater in a sample including many people with essentially normal pulmonary function as well as some with significant obstruction, than in one such as the present sample that included only subjects with significant obstruction.

The measurement of dyspnea and functional status in the current study may also have influenced the relationship between the two variables. Subjects rated dyspnea severity over the past week, giving an "average" of how severe the symptom had been for them during that time. However, the walk test provided a measure of functional status at the exact time of performance only, which might have been an exceptionally good or bad time for individual patients. This mismatch of time frames for measurement may have influenced the relationship between two variables.

Moody et al. (1990, 1991) measured functional status with five subscales of the Arthritis Impact Measurement Scales (AIMS1): mobility, physical activity, dexterity, household activity, and activities of daily living. Subjects in the current study completed four subscales of a revised AIMS (AIMS2): mobility, walking, self-care, and household activity. For reasons described below, the walk test results were chosen as the measure of functional status to be used in the statistical analyses, but it is interesting to examine results from the AIMS2 subscales in attempting to explain the lack of a relationship between dyspnea and functional status in the current study.

Items on the AIMS asked subjects to rate how often they had difficulty with various activities during the past month. A higher score indicates lower functional status on both versions of the AIMS.

The total score on the AIMS2 subscales had a moderately strong correlation with the distance walked ($r = -.666$, $p < .001$) in this sample. The zero-order correlation between dyspnea and the AIMS2 total score was .337 ($p < .001$), compared to a correlation between dyspnea and distance walked of -.198 ($p = .026$).

Most interesting is the effect of substituting the AIMS2 total score for the walk distance in the regression of functional status on age, socioeconomic status, disease severity, and dyspnea (Step 4 in the path analysis; see Table 4-3). Although the multiple R and R^2 decrease with this substitution (from .459 to .429, and from .210 to .184, respectively), the relative effects of the variables change considerably. When the walk test results are used as the measure of functional status, age ($\beta = -.254$, $p = .002$) and disease severity ($\beta = -.335$, $p < .001$) are the significant predictors of functioning, and socioeconomic status nearly attains significance ($\beta = .159$, $p = .051$) as a predictor of functioning. However, when the AIMS2 total score is used to operationalize functional status, disease severity ($\beta = .263$, $p = .003$) and dyspnea ($\beta = .275$, $p = .002$) are the significant predictors. The latter results are in much closer agreement with those of Moody et al. (1990, 1991).

Hence, it seems that the instrument used to operationalize the variable may have had a significant influence on the statistical results. Although it is appealing to consider improving the fit of the data to the proposed model by using the AIMS2 total score instead of the walk test results to operationalize functional status, the decision to use the walk test was based on psychometric and theoretical grounds, and was not made lightly. The walk test was believed to be a more objective measure of functional status than a self-report questionnaire. The walk test has been widely used in previous research in COPD, whereas the AIMS2 was designed for use in arthritis. While all of the AIMS2 items used in this study were quite general, and AIMS1 subscales have been used in various combinations in previous research in COPD, it was believed that the walk test was more suitable for use in a non-arthritis sample. Finally, Guyatt et al. (1985) have held that the walk test is the most suitable indicator of functional status in COPD because it measures subjects' ability to undertake physically demanding activities of daily living, and is a measure that is relevant to their everyday lives.

Contrary to the study hypothesis, dyspnea did not have a direct effect on dispositional optimism. The hypothesis had been based on the ambiguity and potential threat posed by this most distressing symptom, which was expected to take its toll on the expectation of favorable outcomes. The failure of dyspnea to predict optimism may be due to the alternative hypothesis proposed earlier in the discussion of the relationship between disease severity and optimism. Perhaps, as Scheier and Carver (1987) suggested, optimism mediates the perception of symptoms rather than being the result of chronic symptom experience.

Functional status. The direct negative effect of functional status on depression, and the positive effect of functional status on self-esteem as hypothesized by the theoretical model, were supported by the data. The hypothesized effect of functional status on dispositional optimism was not supported, perhaps for the same reason suggested for the relationship between dyspnea and optimism. That is, perhaps optimism is an intervening variable between disease severity and symptoms, rather than symptoms being a predictor of optimism.

One path related to functional status was found that had not been predicted in the proposed quality of life model. First, declining functional status was associated with an increase in anxiety. No previous research related to COPD and known to the investigator has tested the specific hypothesis that functional status is predictive of anxiety, so that this finding was unexpected. However, this result is consistent with the study's theoretical framework, which suggests that constraints on the use of coping resources influence the success of coping efforts. It was suggested in Chapter 2 that anxiety and depression might function as constraints by interfering with the person's positive beliefs about him- or herself, or with the ability to tap into available material or social support resources. Or, anxiety could be a personality characteristic influencing appraisal of the situation of living with COPD.

Mediating variables. The predicted relationships between quality of life and depression, self-esteem, and social support were supported by the data. Specifically, increasing depression predicted lower quality of life, while higher self-esteem and perceived social support predicted higher subjectively perceived quality of life.

The direct negative effect of anxiety, and the direct positive effect of optimism on quality of life hypothesized by the theoretical model were not supported by the data. Possible explanations for these findings are explored below.

It would seem easiest to attribute the failure of the study to find a relationship between anxiety and quality of life to statistical factors, specifically the moderately strong zero-order correlation between depression and anxiety ($r = .655$, $p < .001$). However, when alternative specifications of the path model were tested, anxiety continued to exert little influence on quality of life even when depression was excluded from the model. Therefore, it seems clear that the shared variance between the two mood variables alone does not explain the study findings with regard to anxiety and quality of life, and theoretical explanations must be sought.

Anxiety was an important predictor variable in early research into the quality of life in COPD, including the NOTT (McSweeny et al., 1982) and the IPPB studies (Prigatano et al., 1984). It should be remembered, however, that the measure of quality of life in these studies was illness-related dysfunction. In addition, neither of these studies included in their prediction equations several of the variables considered to be important in the present study, such as dyspnea, self-esteem, and social support.

More recent work has raised questions about the importance of anxiety in COPD in general, and more specifically, in influencing life quality in COPD. For example, the finding of Light et al. (1985) that only 2% of their subjects were anxious casts doubt on the common stereotype that all COPD patients are anxious. Similarly, Traver (1988) demonstrated the heterogeneity of COPD patients with respect to mood by showing that high-emergent users of the health care system differed from low-emergent users on standard measures of anxiety. Finally, Moody et al. (1990) did not include anxiety in their path model of quality of life and functional status in COPD because of its insignificant zero-order correlation with the dependent variables.

These more recent findings, in addition to the results of the current study, suggest that the time has come to reconsider the inclusion of anxiety as a variable in complex behavioral models of COPD. Clearly, a proportion of people with COPD are anxious. However, when quality of life is defined and measured as subjectively perceived satisfaction with life's domains, anxiety appears to contribute very little to the explanation of variability in the concept.

Like anxiety, dispositional optimism had no effect on quality of life in COPD. Optimism also had a moderately strong zero-order correlation with another mediator, self-esteem ($r = .604$, $p < .001$), but this overlap failed to explain the absence of a relationship between optimism and quality of life. Removal of self-esteem from the path model did not produce a significant relationship between optimism and life quality. Optimism remained an insignificant predictor in all alternative specifications of the path model.

Unlike anxiety, dispositional optimism was a concept not previously tested in research in COPD. However, it was conceptually related to other concepts such as locus of control (Brown et al., 1981) and mastery (Moody et al., 1990) that had been explored previously. Its appeal lay in the fact that it represented a generalized outcome expectancy, as opposed to expectations of success, failure, or control over specific domains of life, such as health (Scheier & Carver, 1985, 1987). It was believed that a multidimensional approach to quality of life required a broader-based conceptualization of its antecedents.

The failure of optimism to have any effect on quality of life may relate to its conceptual definition, how the concept was operationalized, or both. As noted above, dispositional optimism was an attractive concept because of its generalized approach to outcome expectancies. However, it is possible that the approach was so general as to lose much of its meaning. A comparison of optimism to the history of the locus of control concept may be useful in explaining this point.

Early work on the locus of control construct took the general approach that people attributed things that happened to them to external (luck, fate, or powerful others) or internal (personal efficacy) factors (Rotter, 1966). However, further explication of the social learning theory from which locus of control was derived led to recognition of the fact that generalized expectations were modified by the specific character of a situation (Rotter, Chance, & Phares, 1972). By the 1980s, some psychologists were advocating that perceptions of control, whether generalized or situation-specific, be examined within the context of specific situations (Folkman, 1984). Others called for the use of domain-specific, rather than generalized measures of locus of control in research related to the construct (Lachman, 1986). Lachman (1986) found that generalized measures of locus of control were unable to discriminate between young and older age groups on control beliefs about intelligence and health, and did not predict behavioral outcomes in these domains as well as domain-specific measures did.

Optimism was defined as the generalized expectation that good rather than bad things would happen to the person, regardless of the source of control over relevant events. The Life Orientation Test, which was used to measure optimism in this study, operationalized this very general approach to outcome expectancies. Perhaps, like locus of control, optimism needs to be examined in the context of a specific situation, rather than in relation to a multi-dimensional conceptualization of quality of life.

Some researchers have suggested that the Life Orientation Test (LOT) may not be measuring optimism at all, but may instead reflect or at least be heavily influenced by the personality dimension of neuroticism (Smith, Pope, Rhodewalt, & Poulton, 1989). In two studies of a mono-method, multi-trait correlation matrix of the LOT with another measure of optimism (the Generalized Expectancy for Success Scale) and two measures of neuroticism (the Taylor Manifest Anxiety Scale [TMAS] and the Trait form of the State-Trait Anxiety Inventory [A-trait]), the LOT shared considerable variance with the measures of neuroticism. Three principal components analyses of the four instruments produced a single factor that accounted for 69.7% to 70.7% of the variance. The authors concluded that previous research results related to optimism should be re-interpreted in light of the apparently strong influence of neuroticism on the scale (Smith et al., 1989).

An interesting counter-argument to the preceding could be made based on the data in the current study. Smith et al. (1989) defined neuroticism as a stable personality dimension consisting of chronic negative emotions such as sadness, anxiety, guilt, and anger. They further stated that measures of any of the components of neuroticism, such as trait anxiety or depression, constituted valid measures of the trait itself. Using this rationale, they used two measures of anxiety to demonstrate discriminant and convergent validity with the LOT in their correlation matrices. They found correlations ranging from -.50 to -.70 between the LOT, the TMAS, and the A-trait.

In this study, the LOT had correlations with the BAI and BDI of -.210 and -.448, respectively. Although both correlations were statistically significant, they are smaller than the correlations obtained by Smith et al. (1989); the correlation between anxiety and optimism is considerably smaller in the current sample than in their samples.

One possible explanation for the difference in the two studies is the fact that Smith et al. (1989) studied undergraduates, as compared to the current study which examined chronically ill older adults. Also, Beck, Epstein et al. (1988) noted that the State-Trait Anxiety Inventory may actually measure a combination of anxiety and depression. It is possible that some of the overlap of the LOT with the A-trait and TMAS may be attributable to the presence of other contaminants in those scales. The BAI, on the other hand, consists entirely of symptoms, and was developed for the specific purpose of discriminating between depression and anxiety. Although it was noted earlier that the discrimination made by the two scales may be less than ideal, it is possible that the BAI provided better discrimination between optimism and anxiety than did the TMAS and A-trait. It is important to note, however, that the argument made by Smith et al. (1989) better explains potential problems with the LOT in the current study than does the response to that argument.

Summary of the Findings

The preceding discussion has addressed the study results in relation to individual variables and the specific relationships hypothesized between pairs of variables in the theoretical model of quality of life in COPD. It is time now to discuss the study findings in a broader context so that they become part of a more meaningful whole.

The theoretical model explained 53% of the variance in subjectively perceived quality of life in COPD, an amount that equals or exceeds that explained by any previous quality of life model in the COPD literature. Four of the 10 predictor variables (age, depression, self-esteem, and social support) had direct effects on life quality. One of these, age, was not a mediating variable and had not been hypothesized to have a direct effect on quality of life, but its direct effect was relatively small ($\beta = .150$). The fact that the most important direct effects were found for three of the mediating variables lends support to the conceptualization of quality of life in COPD as it was proposed in this study.

Although most investigators who have examined quality of life in COPD have not tested the proposition in their research, several researchers (Agle et al., 1973; Barstow, 1974; Kinsman, Yaroush et al., 1983; McSweeny et al., 1982; Morgan et al., 1983b; Prigatano et al., 1984; Schrier et al., 1990; Traver, 1988) concluded that psychosocial factors must mediate the effects of disease severity on functional status and quality of life in COPD. Moody et al. (1990) were the first to explicitly address this hypothesis, although the operationalization of the test did not live up to their theoretical aspirations. Although they proposed a theoretical model of quality of life in COPD that hypothesized the mediating role of psychosocial variables, they did not test that model. Rather, they selected their final model according to statistical, rather than theoretical, criteria. The model selected did, however, provide support for the role of mediators, as it found that the most important predictors of life quality were the mediating variables of mastery, dyspnea, and depression.

The findings of the current study, then, lend empirical support to earlier suggestions about the role psychosocial mediators play in explaining quality of life in COPD. Besides the important role played by the mediators, it should be noted that two antecedent variables did have significant total, though indirect effects on quality of life. These two disease variables, objective disease severity and functional status, have been tested in previous investigations. Functional status has usually been the dependent variable, so that no real precedent exists for its placement as an antecedent variable in COPD, and making it difficult to relate to the findings of this study. However, objective disease severity has frequently been used as a predictor variable in previous research, and its lack of importance has been noted by several investigators (McSweeny et al., 1982; Schrier et al., 1990; Traver, 1988). The findings of the current study suggest that the role of these variables is an important but indirect one mediated by the psychosocial characteristics of the individual patient.

The study results confirm the importance of three psychosocial variables in adaptation to COPD, not all of which have been recognized consistently in previous work. The variable explaining the most variance in quality of life in COPD, self-esteem, has been well-established as one of the most important predictors of life satisfaction in general populations (Diener, 1984). As in the current study, self-esteem explained the most variance in quality of life in arthritis patients (Burckhardt, 1985). Despite these findings from the non-COPD literature, self-esteem has been a relatively neglected variable in previous investigations into quality of life in COPD.

As evidenced by the review of the literature (see Chapter 2), depression has been as much a focus in the COPD literature as self-esteem has been ignored. Its importance as a response to living with COPD has been rightfully emphasized. The findings of this study suggest that depression in turn has a significant negative impact on quality of life, adding new impetus to the call for adequate and appropriate treatment of this mood disturbance in older people (NIH Consensus Development Conference, 1991).

The potential influence of social support on quality of life in COPD has not been explored in previous research. In one of two studies that included social support as a predictor variable (though life quality was not the dependent variable), Jensen (1982) found that COPD patients attending support groups had fewer and shorter hospitalizations than did patients not attending such groups. Lee et al. (1991) found significant zero-order correlations between social support and functioning in severely ill COPD patients. However, social support was not a significant predictor of functioning when it was entered with other variables into a regression equation.

The current study, then, appears to be the first to explore the role social support might play in quality of life in COPD. As in Burckhardt's (1985) study of arthritis patients, social support had a significant direct effect on life quality in this sample of COPD patients. Additional study of social support in COPD is warranted given that this variable falls into the domain of phenomena that nurses can treat independently.

What do the study results have to say about quality of life in older people? The unexpected significant and direct effect of age on quality of life in this study was discussed earlier. Findings related to other variables found to be significant in previous research will be discussed briefly below.

Early research found that health had an important influence on quality of life in older people (Edwards & Klemmack, 1973; Markides & Martin, 1979; Palmore & Luikart, 1973). The results of this study lend support to this notion, in that the effects of chronic illness were shown to have significant, if indirect effects on life quality.

In previous research, socioeconomic status was an important predictor of quality of life in older people, if only in lower socioeconomic groups (Edwards & Klemmack, 1973; Palmore & Luikart, 1973). However, neither of these earlier studies examined as complex a model of life quality as did the current one, and it is possible that intervening variables might have been found to be important had they been included in those studies. Socioeconomic status had a significant zero-order correlation with quality of life in the current sample of COPD patients ($r = .234$, $p = .009$), but it did not have a significant direct or indirect effect in the path analysis. Also, as previously discussed, the subjects in this study were relatively well off in socioeconomic terms. Therefore, if the effect of socioeconomic status is indeed most important in lower strata as Palmore and Luikart (1973) suggested, it would have been difficult to detect in the current sample.

In addition to what the study results have to say about quality of life in COPD and in older people, it is important to consider how they compare to findings of other work in life quality in chronic illness. It will be remembered that the current study was designed to be a replication and extension of Burckhardt's (1985) study of quality of life in arthritis. The replication was imperfect in that some of the study variables differed due to differences in disease characteristics and advances in theory (e.g., in relation to social support) since the earlier study was conducted.

The COPD study results did not precisely replicate those of Burckhardt (1985) in that age, an antecedent variable, had a direct effect on life quality in COPD patients. However, the finding that, other than age, only mediators had direct effects on quality of life in COPD patients is similar to what Burckhardt (1985) found in arthritis patients. Specifically, she found that self-esteem, internal control over health, negative attitude toward the illness, and perceived social support explained the most variance in quality of life in people with arthritis. In COPD patients, self-esteem, depression, and social support were the most important predictors of life quality. Therefore, it seems that mediators of responses to these two chronic diseases, both of which are characterized by uncomfortable and often disabling symptoms, share more similarities than differences. The significance of this fact will be discussed later in relation to implications for theory, practice, and research.

In summary, this section has looked at the study results in relation to previous findings about quality of life in COPD, older people, and those with another chronic illness. Following an examination of the limitations of the study, the relevance of the findings to nursing theory, practice, and research will be discussed.

Limitations of the Study

Cook and Campbell (1979) described a number of threats to reliability and validity of quasi-experimental studies. Although the present investigation was observational in nature, many of the criteria they identified are relevant to evaluating the study design. Therefore, their criteria will be used as a framework for discussing the limitations of the current study. Only the specific threats to the various types of validity that are relevant in a cross-sectional, observational study will be discussed here.

Statistical Conclusion Validity

Most research studies seek to determine whether relationships exist between two or more variables, and some seek to determine whether one variable causes another. In order to infer causality, the two variables must covary, and covariance is demonstrated by the use of statistical tests. Threats to statistical conclusion validity, such as random error or inappropriate use of statistical tests, may lead to false conclusions about covariance (Cook & Campbell, 1979).

Although the current study was not intended to determine causality, it was concerned with covariance of variables. Therefore, it is important to examine the study methods in terms of threats to statistical conclusion validity. Several such threats were present in the current study. The methods by which they were addressed are described below.

Low statistical power. Low statistical power can increase the risk of a Type II error, that is, failure to reject the null hypothesis when it is false. Causes of inadequate power include selecting too small a sample size to detect the hypothesized relationships, setting too stringent an alpha level of significance, or using statistical tests that are low in power.

In this study, an _a priori_ power analysis was performed to determine the sample size required to detect the effect of a specific variable, social support, on quality of life (see Appendix). This particular relationship was selected for the power analysis because it was expected to be the smallest of all of the relationships between any of the mediators and the dependent variable, and because social support was of special interest in relation to future nursing intervention studies. The final sample size of 126 exceeded that required by the power analysis (i.e., 120).

The level of significance required for the regression coefficients was set at $\alpha = .05$. Rather than being too stringent, this level may have been somewhat liberal, since no correction was made for the fact that the path analysis required several regression analyses. (This issue is discussed further below in relation to the error rate.) However, the use of two-tailed tests of significance was more conservative than one-tailed tests would have been. More of the hypothesized paths might have been found to be statistically significant had one-tailed tests been used.

Multiple regression is a powerful statistical technique because it analyzes the collective (i.e., a linear combination of all variables) and unique (i.e., the effect of one variable over and above that of the other variables) effects of the independent variables on the dependent variable (Cohen & Cohen, 1983; Pedhazur, 1982). It is a flexible and highly general technique that serves as the basis for many other statistical procedures (Tabachnick & Fidell, 1989). Therefore, the power of the statistical tests used was adequate for the purposes of the study.

Violated assumptions of statistical tests. A second threat to statistical conclusion validity was the possibility of violating the assumptions of multiple regression and of path analysis. These assumptions included the normal distribution of scores for each variable, the linearity and homoscedasticity of relationships between variables, and the absence of correlated residuals. As discussed in Chapter 3, each of these assumptions was met, although there was some heteroscedasticity when the residuals were plotted against the predicted quality of life score. An additional assumption for regression analyses, that of the reliability of measures, is discussed below.

Fishing and the error rate. The risk of a Type I error (i.e., rejecting a true null hypothesis) increases when multiple statistical tests are conducted, as the likelihood of finding significant relationships due to chance alone increases with the number of tests. Thirteen regression analyses were performed in the path analysis, which might have led to a substantial risk of a Type I error. However, statistical tests were limited to those specified a priori by the theoretical framework of the study. No attempt was made to capitalize on chance based on statistical criteria alone. Based on these considerations, the risk of a Type I error in this study was judged to be acceptable.

Reliability of measures. Statistical conclusion validity is threatened by the use of unreliable measures. The use of reliable measures is also an assumption of multiple regression analysis. Therefore, instruments were chosen for this study based not only on how well they operationalized the theoretical constructs, but also on their reliability as demonstrated in previous research. As noted in Chapter 3, Cronbach's alpha consistency reliability coefficients and test-retest reliabilities, when available, were acceptable for all of the instruments used in this study. Each of the instruments performed well in terms of internal consistency reliability in the present study (see Table 3-3).

Reliability of treatment implementation. As noted earlier, Cook and Campbell's (1979) discussion was concerned with quasi-experiments rather than observational studies. Thus, the threat to validity posed by differences in treatment implementation does not directly apply to this study. However, the possibility exists that the two interviewers in this study conducted interviews differently. This concern is probably of minor importance because the large majority of items were administered by way of a written questionnaire. It is of more concern for the Dyspnea Visual Analogue Scale, which was verbally administered. Although the interviewers undoubtedly differed in personal style, a detailed set of instructions and standardized examples for practice were intended to minimize the effect of the interviewer on the subject's response.

Random heterogeneity of respondents. Finally, random heterogeneity of the respondents in relation to study variables can threaten statistical conclusion validity. This threat occurs in quasi-experimental designs when subjects in different treatment groups differ on factors associated with the dependent variable. In an observational study, the concern is that subjects differ from non-participants in some systematic way.

The study variables most likely to pose a problem in this regard were socioeconomic status, functional status, and depression. Potential subjects who were without telephones or who had limited transportation were less likely to be able to contact the investigator about their interest in the study, or to be able to keep appointments with their physician or the investigator.

The original study protocol called for some subjects to be interviewed at home to insure that some homebound subjects were included in the sample. However, after the study began, it became evident that even "homebound" patients came to the clinic for their physician's appointments, and it was no longer believed to be necessary to do in-home interviews. The participation of four wheelchair users in the sample indicates that some people with very limited function were included in the study. However, the possibility does exist that some potential subjects who were completely homebound were excluded from participation because they were unable to come to the clinic for the interview.

It is possible that severe depression prevented some potential subjects from participating in the study. Patients immobilized by a severely depressed mood would be unlikely to be able to summon the energy to volunteer for or participate in the study. Unfortunately, there is no way of knowing how many potential subjects did not volunteer for this reason. The normal distribution of depression scores in the sample is the only indication that patients with all degrees of depression were included in the sample. However, the lower proportion of depressed patients in this sample compared to previous studies may be an indication that some depressed patients were unintentionally excluded from the study.

Internal Validity

Once it has been established that a relationship exists between two variables, quasi-experimental designs ask the question: did one variable cause the other? The internal validity of the study design reflects the accuracy with which the relationships between variables have been characterized (Cook & Campbell, 1979; Woods & Catanzaro, 1988). Although observational studies do not manipulate variables and therefore cannot demonstrate causality, some of the threats to the internal validity of the study are relevant to evaluation of the study design.

History. When an observation could be the result of events external to the study and might alter the observation of the relationships made in the study, the effect of history is said to be operating (Woods & Catanzaro, 1988). In this study, for example, if new information became available about the adverse effects of second-hand cigarette smoke, family members might be less willing to spend time with a patient who smokes, leading to a reduction in perceived social support. There is no evidence that history did or did not have an effect on subjects in this study, but it is possible that some unknown factors were operating.

Maturation. Maturation, a change in respondent characteristics over time (Cook & Campbell, 1979), was unlikely to be operating in the current study since subjects were observed on only one occasion. It is possible that subjects of different ages or in different stages of their disease responded to their illness differently, but changes over time could not be detected with the cross-sectional study design.

Instrumentation. A threat to internal validity related to instrumentation occurs when the measures change between pre- and post-testing in a quasi-experimental design (Cook & Campbell, 1979). In an observational study, the interviewer may become more experienced over time, so that subjects participating later in the course of the study have a different experience than those participating earlier. In this study, the interviewers became more efficient at conducting the interviews over time. However, the majority of the items were administered by written questionnaire, so that responses should not have been influenced by changing interviewer expertise. Standardized instructions were used for the Mini-Mental State Examination, Dyspnea Visual Analogue Scale, demographic data sheet, spirometry, and 6-

minute walk test to minimize the influence of the interviewers on subject performance on these measures.

Selection. The threat of selection bias is usually related to the differential selection of respondents with specific characteristics into particular treatment groups (Cook & Campbell, 1979). This consideration is not relevant in an observational study of a single group. However, as was noted above, it is possible that the recruitment of subjects for this study systematically excluded patients with certain characteristics. For example, those who were most depressed or anxious, or least functionally independent, may have been excluded from the sample.

Other threats to internal validity. Effects of testing (i.e., familiarity with testing over time influences the responses at later measurements), statistical regression (the tendency for extreme scores to be closer to the mean upon retesting), experimental mortality (loss of subjects with particular characteristics over time), and others (Cook & Campbell, 1979) generally do not operate in a cross-sectional, observational study. Therefore, they will not be discussed in relation to the current investigation.

Construct Validity of Putative Causes and Effects

Construct validity of putative causes and effects is concerned with how well the research problem has been conceptualized, and how well the instruments operationalize the constructs being measured (Cook & Campbell, 1979).

Several threats to construct validity are relevant to the present study.

Inadequate pre-operational explication of constructs. Each construct studied requires a conceptual definition since the selection of the measure (i.e., operational definition) follows directly from it. In this study, variables or constructs were carefully selected and defined during the development of the theoretical framework. With the exception of dispositional optimism, each of the constructs was well-established in the literature, and had been studied extensively in previous sociological, psychological, or health-related research. Accepted definitions for each of the variables, including the dependent variable, were used.

Although the majority of the concepts included in the theoretical model were well-established, some of the hypothesized theoretical relationships could have been questioned. For example, considerable evidence could be marshalled for the hypothesis that depression leads to a decrement in functional status (e.g., see Weaver & Narsavage, 1992), rather than the reverse as was hypothesized in the model. Similarly, it was suggested earlier in this chapter that optimism may mediate the relationship between disease severity and symptoms. This hypothesis runs contrary to the theoretical model, which proposed that optimism was dependent on disease severity through symptoms. To test such bidirectional relationships, more advanced statistical techniques, such as LISREL (along with multiple measures for each concept and a much larger sample size), would have been required (Pedhazur, 1982).

Mono-operation bias. The use of only one measure to operationalize each construct constitutes mono-operation bias (Cook & Campbell, 1979). This threat was present in the current study in that each variable was measured with only one instrument. The decision to limit the measures was a deliberate one, as the inclusion of additional instruments would have caused a significant increase in respondent burden. Because the planned statistical analyses did not require that multiple measures be obtained, the trade-off of potential bias versus respondent burden was judged to be acceptable.

Mono-method bias. Mono-method bias is present when all of the study instruments use a single method (Cook & Campbell, 1979), such as self-report questionnaires. This bias was present to some extent in the current study, in that the majority of instruments were paper-and-pencil self-report questionnaires. The exceptions were age (data were obtained from subjects' clinic charts), the 6-minute walk, and spirometry. Therefore, responses to the majority of items may have been affected for subjects who had difficulty with summated rating scales, those who tended to use a response set, or who had low literacy skills.

In order to facilitate understanding of questionnaire instructions, each subject was asked to read the instructions for the first questionnaire with the interviewer present. After the instructions had been read, the interviewer used one item as an example of how to complete the questionnaire. All subject questions about the method were answered, although interviewers were careful not to provide clues or hints as to how the subject should respond to a particular item. Subjects were instructed to read the instructions at the beginning of each new questionnaire, and were cautioned that each one was slightly different from the others.

The tendency of subjects to select the same response to all items on a given instrument was minimized in the following ways. First, the questionnaires differed in the range of possible responses, requiring respondents to read carefully enough to detect the changing response formats. Second, three of the instruments contained some items that were worded in the opposite direction from the others, so that subjects again had to read each set of choices before responding. Although many subjects demonstrated a tendency to choose similar answers on a given questionnaire, only one subject included in the final sample failed to detect the reversal of items on some instruments.

Evaluation apprehension. Study participants may try to portray themselves in the most favorable light to the investigator (Cook & Campbell, 1979). The desire to appear competent and independent may be particularly pronounced in older people (Herzog & Rodgers, 1986). Therefore, subjects were instructed that there were no right or wrong answers to the items, and were asked to choose the answer that was right for them. They were assured that no one would see their responses except for the investigator, and that even then, their name would not be on the questionnaire. Interviewers left the room during completion of the written questionnaire so that subjects would feel free to answer the items honestly.

Hypothesis-guessing with experimental conditions. Subjects in experiments may try to guess how the researcher expects them to respond to the treatment, resulting in difficulty in interpreting the results (Cook & Campbell, 1979). Although this was not an experiment, subjects could have tried to guess the research hypothesis about how the predictor variables affected the outcome, and attempted to answer the items in a way that was congruent with the hypothesis.

In all contacts with potential and actual subjects prior to completion of the questionnaire, the investigator was careful to give an accurate description of what they would be asked to do, and what types of questions would be asked, without stating the study hypotheses explicitly. No subject asked about the specific hypotheses before completing the study. However, a few did make such inquiries following completion of the study, and their questions were then answered in full.

External Validity

In general, researchers want to be able to make statements related to the research question about the population from which their sample was drawn. The validity with which the researcher can say that the findings apply to the larger population of patients, not just the sample actually studied, is referred to as external validity (Cook & Campbell, 1979).

The best way to ensure generalizability of findings is to draw the sample at random from the population. However, in this study, a convenience sample was used in order to obtain the necessary number of subjects within a narrow time frame. Therefore, it is possible that selection bias (as described above) occurred.

One way to compensate for the inability to randomize is to sample from more than one setting. However, this strategy was not feasible for the current study given the logistical requirements of the protocol, the distance between the investigator's home and the clinic (46 miles), and the time available to collect the data (3 months). In addition, the chart review to identify potential participants was a very time-consuming task, as were the follow-up telephone calls in response to returned postcards.

These tasks were often performed between scheduled interviews, thus using the investigator's time more efficiently while at the clinic.

Despite the fact that subjects were not selected at random, subjects resembled the clinic population on four variables on which data for non-participants were available: age, gender, disease severity, and home oxygen use (see Chapter 3). Thus the selection procedure, though less than optimal, did produce a sample that was representative of the clinic population on at least two study variables as well as on two additional disease or demographic variables.

Implications for Theory, Practice, and Research

Implications for Theory

Although the present study was not designed to be a test of Lazarus and Folkman's (1984) theory of stress, coping, and adaptation, the results do lend support to their conceptualization of the role of coping resources in influencing adaptation to stress. Specifically, positive beliefs about the self (operationalized as self-esteem) and social support were found to be important in mediating the effects of chronic illness on quality of life, consistent with the theory. The finding that depression was also an important mediator is consistent with the notion that mood alterations influence primary appraisal of a situation, or might represent a constraint upon use of other coping resources.

The correspondence of results of the present study with those of Burckhardt (1985) in arthritis patients has implications for the development of nursing theory related to quality of life in chronic illness. Although clear differences exist between chronic diseases in symptom experiences and functional limitations, it also appears that people use similar resources in managing the challenges posed by chronic illness, regardless of the precise nature of the disease. However, additional exploration of the role of possible antecedent variables and their relationships with each other is needed to further develop such a theory.

Implications of the study findings for nursing theory related to quality of life in COPD include the need to reconsider previous ideas about how life quality is defined and measured. Quality of life is just one among several possible adaptational outcomes of living with COPD, and may not be the most important outcome in many situations. However, when quality of life is an important outcome, care should be taken not to confuse it with other concepts such as symptoms, mood state, or functional status. Careful conceptualization of variables leads to greater clarity of hypotheses, and enhances the validity of study findings (Cook & Campbell, 1979).

Despite careful definition of the variables in the current study, and theory-based placement of variables in the hypothesized model, not all of the hypothesized relationships were supported by the data, and some unexpected relationships were found. The results confirm the need for careful model specification and suggest that more complex models may be required to more fully explain quality of life in COPD.

Implications for Clinical Nursing Practice

Downs (1993) has urged caution in attempting to apply the findings of studies testing theoretical relationships to clinical nursing practice. Observational studies like the present one seek to identify relationships among variables that may be suitable for later testing (see below). It may not be appropriate to recommend changes in nursing practice based on the results of such studies, however. Since the theoretical relationships hypothesized in this study were only partially supported, the findings can serve as guides for nursing care, but should not be looked upon as prescriptive. With this caveat, the discussion of implications of the study results for nursing practice will be limited to recommendations that are consistent with suggestions in the literature or the findings of other research.

In this study, the most important predictor of quality of life in COPD was self-esteem. Although self-esteem is thought to be a fairly stable psychologic attribute, it can change in response to significant personal or environmental alterations (Kersten, 1990). In this sample, self-esteem was negatively affected by increasing disease severity and decreasing functional status. Opportunities for nursing intervention exist in relation to self-esteem itself and its precursors, functional status and disease severity. Interventions related to self-esteem and functional status will be discussed here, while those related to disease severity will be addressed later in this section.

Agle et al. (1973) believed that the functional status of patients in their pulmonary rehabilitation program improved due to several psychologic factors. Among these were: increased patient independence in self-care, leading to increased perceived control of symptoms; communication from staff that patients were worth the effort being exerted; and setting of realistic goals which, when attained, contributed to increased self-esteem. Kersten (1990) found increased self-esteem in 37 COPD patients after participation in a three-week pulmonary rehabilitation program. This change occurred despite the absence of interventions aimed specifically at increasing self-esteem. Although both of these studies had significant methodological weaknesses, they provided beginning evidence of the types of interventions that could enhance self-esteem in COPD patients. Specifically, exercise training and patient education in symptom management and energy conservation measures have the potential to improve functional status, perceived control, and ultimately, self-esteem in COPD patients.

In addition to interventions aimed at increasing self-esteem indirectly by improving functional status, Taft (1985) suggested that older people's self-esteem could be enhanced more directly in a variety of ways. Although her recommendations were made for the specific population of institutionalized elders, they are applicable, with some adaptation, to the chronically ill person living in the community or participating in a pulmonary rehabilitation program. For example, group work that reinforces past and present achievements and communicates support to each person may enhance self-esteem (Taft, 1985). Such work could be carried out within the context of a formal pulmonary rehabilitation program, through hospital-based support groups, or through support groups sponsored by organizations such as the local chapter of the American Lung Association.

Communication by nurses of positive attitudes toward COPD patients, rather than negative stereotypes, can also help maintain or build self-esteem. Increased social interaction through group work or referral to community agencies providing companionship may enhance self-esteem. Finally, nurses can emphasize patients' choices in their own health care, thus increasing their sense of perceived control over both that care and their lives in general.

Depression has long been recognized as a frequent accompaniment to COPD (Agle et al., 1973; Dudley et al., 1973; Labuhn, 1984; Light et al., 1985; McSweeny et al., 1982). The present study found evidence that depression has a significant adverse effect on how people with COPD perceive the quality of their lives. However, depression often remains undiagnosed and under-treated in older people in general (NIH Consensus Development Conference, 1991) and in people with COPD (Borson et al., 1992). Thus, one role of the nurse in caring for the COPD patient is to be alert for clinical signs and symptoms of depression, and to advocate for or initiate treatment of depressed mood (depending on the practice role of the individual nurse) when it is identified.

Clinical experience suggests that COPD patients with recognized depression often receive inadequate treatment due to lack of patient understanding of why the medication has been prescribed or how it should be taken. Knowing the role of depression in affecting life quality, nurses should take an active role in providing patients with the information necessary to maximize treatment effectiveness.

The third mediating variable found in this study to have a direct effect on life quality was social support. Nursing interventions to enhance perceived support have been mentioned earlier in relation to self-esteem and functional status. Group interaction in the context of a pulmonary rehabilitation program (Agle et al., 1973), or in institutional settings (Taft et al., 1985), can heighten perceived support.

More innovative and less costly interventions that could be carried out by nurses could also be designed. Weinberger, Hiner, and Tierney (1986) found that pain, physical and psychologic disability, and perceived social support improved after 6 months of bi-weekly telephone interviews of patients with osteoarthritis. Although their study lacked a control group, they attributed these improvements to the social support provided by the interviewers. A relatively inexpensive nursing intervention for community-residing patients with COPD would be scheduled telephone calls to patients unable or unwilling to participate in support groups.

These formal types of social support could supplement patients' informal support systems, or substitute for them when the informal system is inadequate or characterized by conflict or strain (Stewart, 1989). Another approach to enhancing social support is to improve the adequacy of the patient's informal social network.

Pancoast and Chapman (1982) identified six types of informal helpers: family and friends; neighbors; natural helpers in the community (people to whom others turn for help); role-related helpers, such as storekeepers, bank tellers, and mail carriers; people with similar problems; and volunteers. Primomo, Yates, and Woods (1990) found that partners of chronically ill women were the most important sources of social support; other family members were next in importance. Therefore, nursing interventions to improve coping in families of COPD patients could help them to be more effective supports for their ill members. When family members are unavailable, unable, or unwilling to provide support, nurses can help patients to identify and enlist other informal helpers. For example, natural helpers and volunteers can be recruited through both formal and informal community channels.

In addition to functional status, which was referred to above in relation to self-esteem and social support, disease severity was the second antecedent variable with significant total, though indirect effects (through depression and self-esteem) on quality of life. Although COPD is progressive and medical treatment largely symptomatic, the progression of disease severity can be ameliorated if exposure to airway irritants is reduced or eliminated (Edelman, 1992). Nurses play an important role in patients' smoking cessation efforts, through both education and support of the patient who has quit. Nurses can also educate patients about the irritant effects of both indoor and outdoor air pollution, as well as ways to prevent upper and lower respiratory tract infections.

Implications for Further Research

The two major hypotheses tested in this study were that demographic and disease variables would have only indirect effects, and that mediating variables would have direct effects on quality of life in COPD. These hypotheses were only partially supported by the data. Therefore, further testing of alternative models of life quality in COPD is needed to confirm these results and to identify other variables that might explain additional variance in life quality in COPD.

Another approach to modeling quality of life in COPD involves increasing theoretical complexity by examining nonrecursive, or bidirectional relationships. Advanced statistical techniques, such as LISREL, could be used in the analysis of such models. In addition to the fact that LISREL can be used to test nonrecursive models, it is also free of many of the assumptions made by multiple regression. It is thus a more versatile and powerful tool than path analysis for testing theoretical models (Pedhazur, 1982).

Despite the fact that the theoretical model proposed in this study was not fully supported, some important relationships were found among predictor variables and between predictors and quality of life. Since a second purpose of this study was to identify variables that influence subjectively perceived quality of life in COPD that could be tested in intervention studies, it is appropriate to make proposals for future studies involving variables found to be important in this study. These suggestions will be limited to proposals for testing interventions related to two mediating variables found to be important in this study.

General interventions to build self-esteem were suggested earlier in relation to clinical nursing practice. These suggestions require greater specificity and testing in clinical trials. Since patients in pulmonary rehabilitation programs have perhaps the most sustained contact with nurses, this setting may be the most useful for implementing self-esteem interventions. A clinical trial could be designed to test specific components of the rehabilitation program aimed at increasing self-esteem. Self-esteem components might include some or all of the following: realistic goal-setting and regular review and reinforcement of goal achievement (Agle et al., 1973); incorporation of standardized positive feedback for incremental improvement in exercise tolerance; allowance for patient choices within the goals of the program to increase perceptions of self-control; participation in a support group to enable patients to share experiences and exchange ideas (Taft, 1985).

A clinical trial could be designed to look at social support interventions that might affect self-perceived life quality. A program of regular telephone contact with patients lacking adequate support would be an inexpensive yet potentially effective means of increasing perceived support (Weinberger et al., 1986). Improved functional status and psychological well-being related to the support might also work indirectly or directly to improve quality of life.

Summary of Implications

The preceding section has reviewed proposals for application of the study findings in nursing theory development, clinical nursing practice, and future research. Many of the recommendations, particularly in relation to nursing practice, should be regarded as tentative given the exploratory nature of the study and the fact that nursing interventions were not tested. However, the study results do provide direction for further theory development and research related to quality of life in COPD.

Summary

This cross-sectional, observational study sought to identify factors influencing quality of life in COPD, and to identify intervening variables that mediated the effects of these factors on life quality. Variables were selected for testing based on the investigator's clinical experience and previous research findings. Using a framework derived from the stress, coping, and adaptation theory of Lazarus and Folkman (1984), variables were placed in a proposed theoretical model of quality of life in COPD.

Quality of life was defined as the subjective perception with life in domains of importance to the individual: physical and material well-being; relations with other people; social, community, and civic activities; personal development and fulfillment; recreation; and independence. The major study hypotheses were that demographic (age, socioeconomic status) and disease (disease severity, dyspnea, and functional status) variables would have only indirect effects on quality of life, and that the mediating variables would have direct effects on quality of life. In addition, a number of relationships among antecedent and mediating variables were hypothesized (see Figure 2-1).

A convenience sample of 134 people with COPD recruited from the population of a private pulmonary specialty clinic in Tacoma, Washington participated in the study; 126

subjects were included in the data analysis. Inclusion criteria for the study were that the patient be over age 40, have a diagnosis of COPD with an FEV_1 less than or equal to 70% of predicted, be English-speaking, and have no significant cognitive impairment. Potential subjects were excluded if they had had an acute exacerbation of COPD within the previous 3 weeks, or if their functional status was impaired by a condition other than COPD.

Subjects completed a written questionnaire and a brief interview, and performed a 6-minute walk test. If they had not had spirometry performed within the previous 12 months, simple spirometry was also measured. After testing to determine that relevant theoretical and statistical assumptions had been met, the data were analyzed using path analysis.

Fifty-three percent of the variance in quality of life was explained by the model. The major study hypotheses were partially supported by the data. Three mediating variables (depression, self-esteem, and social support) had direct effects on quality of life, while two mediators (anxiety and dispositional optimism) did not. In addition, one antecedent variable, age, had a direct effect on quality of life. Two antecedent variables, disease severity and functional status, had significant total, though indirect effects on quality of life.

The finding of a direct effect of age on quality of life in COPD was an unexpected one, since it had been hypothesized to exert its effects only through increasing disease severity and declining functional status. However, McSweeny et al. (1982) found an effect of age on life quality in severely ill COPD patients, as did earlier social science researchers (Campbell, Converse, & Rodgers, 1976). Perhaps surviving to an older age confers benefits on quality of life in and of itself, or perhaps people find that their needs better fit their niche in life in their later years (Campbell, Converse, & Rodgers, 1976).

The significant effect of depression on quality of life was expected because depression has been linked persistently and significantly with COPD in past research. However, the absence of a relationship between anxiety and quality of life was surprising since it, too, has traditionally been associated with the diagnosis of COPD in the past. However, the finding in this study is consistent with more recent research demonstrating that not all COPD patients are anxious (Light et al., 1985; Traver, 1988).

The study findings of direct effects of self-esteem and social support on quality of life in COPD support those of Burckhardt (1985) in arthritis patients. However, dispositional optimism did not have its hypothesized effect on life quality. It was suggested that the concept of optimism may have been too general to have meaning in the context of the theoretical model. Another possibility is that the instrument used to operationalize optimism, the Life Orientation Test, may have been conceptually unclear so that optimism was not adequately operationalized.

The study had several limitations, of which only the most important will be described here. First, bias may have been introduced by the method of sample selection or the setting in which the data were collected. Second, the recursive model of quality of life might have had limited theoretical adequacy, since many relationships between variables could be argued to be bidirectional. Finally, the use of multiple regression analyses required that many theoretical and statistical assumptions be met, whereas more advanced statistical techniques, such as LISREL, would have been more flexible in this regard.

Implications of the study results for theory, practice, and research were discussed. The findings were generally supportive of Lazarus and Folkman's (1984) theory of stress, coping, and adaptation. The results in COPD patients were consistent with those found earlier in arthritis patients (Burckhardt, 1985), indicating that some tentative generalizations about coping with chronic disease across chronic illness groups can be made.

The study is the first with an adequate sample size to define quality of life in terms of patient perceptions rather than functional status or symptoms. A recommendation was made to enhance conceptual clarity in future research into life quality in COPD by clearly defining and measuring outcome variables, so that validity of the findings is increased.

Suggestions for application of the findings to clinical nursing practice were made, with the caveat that the recommendations were tentative given the descriptive nature of the research. Implications for future research were discussed in terms of the need to increase theoretical complexity and statistical sophistication. Specific suggestions for future clinical trials of nursing interventions in relation to two of the important mediating variables were also made.

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LIST OF APPENDICES

APPENDIX A

Institutional Review Board Letter of Approval

OREGON
HEALTH SCIENCES UNIVERSITY
3181 S.W. Sam Jackson Park Road, Portland, OR 97201-3098
Mail Code L106, (503) 494-7887 Fax (503) 494-7787
Institutional Review Board/Committee on Human Research

DATE: June 30, 1992

TO: Kathryn Anderson, M.N. SN
c/o Carol Burckhardt, PhD

FROM: The Committee on Human Research

SUBJECT: ORS#: 3093
TITLE: Quality of Life in Chronic Obstructive Pulmonary Disease.

This confirms receipt from you of the revised consent form(s) and/or answers to questions, assurances, etc. for the above-referenced study.

It satisfactorily meets the recommendations made by the Committee on Human Research at its recent review. The proposal to use human subjects is herewith approved. It is requested that the date of this memo be placed on the top right corner of the first page of the consent form. This is the approval date of this revised consent form.

Investigators must provide subjects with a copy of the consent form, keep a copy of the signed consent form with the research records, and place a signed copy in the patient's hospital/clinic medical record (if applicable).

Approval by the Committee on Human Research does not, in and of itself, constitute approval for implementation of this project. Other levels of review and approval may be required, and the project should not be started until all required approvals have been obtained. Also, studies funded by external sources must be covered by an agreement signed by the sponsor and the Oregon Board of Higher Education.

If this project involves the use of an Investigational New Drug, a copy of the protocol must be forwarded to the Pharmacy and Therapeutics Committee (Pharmacy Services - Investigational Drugs, OP-16A).

Thank you for your cooperation.

XC: CAROL BURCKHARDT, PHD

wp:rcfapp 3/92

APPENDIX B

Chart Data Screening Form

Chart Data Screening Form SUBJECT ID ________

Date of Birth ________ AGE ____

Medical diagnoses--lung disease
(Check all that are listed)

____ Emphysema
____ Chronic bronchitis
____ COPD
____ Asthma
____ Other (name) ________

Date of last hospitalization for lung disease ________
(NR = None recorded)

Date of last exacerbation (antibiotic treatment, Prednisone increase, other intensification of therapy; NR = None recorded) ________

Medical diagnoses--non-pulmonary (note with * any dxes that potentially limit function)

Spirometry Date ________ Reason ________
Stable? Yes/No

Do not complete if data are > 1 yr. old or patient unstable. FEV1 ____

	Pre-bronchodilator liters/% predicted	Post-bronchodilator liters/% predicted
FVC	/	/
FEV_1	/	/
FEV_1/FVC	/	/

Meets criteria? Yes No
If No, why not?
Age < 40
Hospitalization/exacerbation
If unstable, date patient can be interviewed ________
Other functional limitation
FEV_1 > 70% predicted

If Yes or conditional (no recent PFTs):
Done?
____ 1. Complete items 15 through 18 on Descriptive Data Form.
____ 2. Assign Subject ID number.
____ 3. Address envelope.

Appt. Date ________

Date of Letter ________

APPENDIX C

Letter of Introduction and Telephone Script

BRUCE D. BUCHANAN, M.D., P.S.
CLYDE H. KOONTZ, M.D., P.S.
BARRY J. WELED, M.D., P.S.
JOHN H. ROWLANDS, M.D., P.S.
ARTHUR R. KNODEL, M.D., P.S.
JAMES R. TAYLOR, M.D., P.S.
KATHLEEN S. DORR, A.R.N.P.

PULMONARY CONSULTANTS

Dear ____________________________

Many people are concerned about maintaining their quality of life as they grow older, especially if they have a chronic illness such as emphysema, chronic bronchitis, or asthma. Little is known about how lung disease affects quality of life or about how health care providers can help people with chronic lung disease maintain or improve their quality of life.

Kathryn Anderson is a nurse with advanced training in respiratory care who has worked with chronic lung disease patients in their homes for several years. She is currently a graduate student and is conducting a research study to learn more about quality of life in chronic lung disease. Since you are a person who is living with chronic lung disease everyday, she is interested in talking with you about some of the things that may influence your quality of life.

If you are interested in participating in this study, Kathryn would like to interview you at the time of your next doctor's appointment. The interview would last approximately one hour.

If you would be willing to have Kathryn call you to explain more about her study, please return the enclosed postcard. It is important that you return the card promptly so that Kathryn can arrange to meet you the next time you are in the office. Returning the postcard does not obligate you in any way. Participation in the study is completely voluntary and confidential, and your care at Pulmonary Consultants or elsewhere will not be affected by your decision.

As respiratory physicians, we would encourage your participation in this study. Quality of life is of increasing concern to many people and sharing your experience with Kathryn may help other patients in the future. If you have any questions, please feel free to call Kathryn at 206-361-0777, or Kathy Dorr (in our office) at 206-572-5140.

Sincerely,

Bruce D. Buchanan, M.D.

Clyde H. Koontz M.D.
Clyde H. Koontz, M.D.

Barry J. Weled, M.D.

John H. Rowlands, M.D.

Arthur R. Knodel, M.D.

James R. Taylor, M.D.

FRANK S. BAKER CENTER • 316 SOUTH K STREET, SUITE 401 • TACOMA, WASHINGTON 98405 • (206) 572-5140

TELEPHONE SCRIPT

Thank you for returning the postcard I sent you. Let me tell you a little bit about the research study.

The purpose of the study is to identify factors that affect quality of life for people who have emphysema, chronic bronchitis, or asthma. The factors that I am studying are: lung function; shortness of breath; your ability to do your daily activities, such as bathing, dressing, shopping and so forth; socioeconomic status; your mood, self-esteem, general outlook on life; and the kinds of support you get from other people.

The study consists of an interview during which I will ask you some questions, and have you fill out some questionnaires that ask about all of those things I just listed.

(For those needing spirometry) The second thing I'll ask you to do is a simple lung function test where I'll ask you to blow into a machine three times. Have you ever done this test before?

The last thing that I'll ask you to do is to walk at your own pace for six minutes to get an idea of how much exercise you can tolerate. You can go at your own pace, and you can sit down and rest as often as you need to.

Does this sound like something you would be interested in?

If yes, then: I'd like to ask you a question to be sure that you match the criteria I have for people to be in the study: Do you have any other health problems that limit you in doing daily activities like bathing, dressing, walking, and so on? Examples of health problems I am thinking of are severe arthritis, chest pain, pain in the legs with walking, or stroke.

If yes, then: I appreciate your volunteering for my study, but I am looking for people who are limited only by their breathing. Thank you for your time and your willingness to take part in the study.

If no, then: That sounds just fine. I'd like to ask you to take part in the study. *(Arrange time either before or after MD appt.)*

Do you use oxygen? *(If yes, ask him/her to bring portable tank.)*
Do you use any inhalers like Proventil or Alupent? *(If yes, ask to bring.)*

APPENDIX D

Study Checklists

Subject ID ___________

QUALITY OF LIFE IN COPD

Study Checklist: Subject Getting Spirometry

_____ 1. Consent form.

_____ 2. Use inhaled bronchodilator. Indicate medication below. If subject doesn't have an inhaler with him/her, assume s/he is maximally bronchodilated.

_____ albuterol (Proventil, Ventolin)
_____ metaproterenol (Alupent)
_____ isoetharine (Bronkosol)
_____ bitolterol (Tornalate)
_____ pirbuterol (Maxair)

(Note: subject should not use inhaled steroid, cromolyn, or atropine/ipratroprium for this test.)

_____ 3. MMSE and VAS.

_____ 4. Questionnaire; after subject completes, look over and try to fill in any blanks.

_____ Total score on BDI
_____ Score on self-harm (item I)

_____ 5. Complete demographic data sheet.

_____ 6. Spirometry.

_____ 7. Walk test.

(If BDITOT > 18, or if subject chose 2 or 3 on Item I, discuss need to inform physician of score. If Item I is scored 2 or 3, probe suicidal intent.)

Subject ID ___________

QUALITY OF LIFE IN COPD

Study Checklist: Subject Not Getting Spirometry

_____ 1. Consent form.

_____ 2. MMSE and VAS.

_____ 3. Questionnaire; after subject completes, look over and try to fill in any blanks.

_____ Total score on BDI
_____ Score on self-harm (Item I)

_____ 4. Complete demographic data sheet.

_____ 5. Walk test.

(If BDITOT > 18, or if subject chose 2 or 3 on Item I, discuss need to inform physician of score. If Item I is scored 2 or 3, probe suicidal intent.

APPENDIX E

Consent Form

Approved 6/30/92

OREGON HEALTH SCIENCES UNIVERSITY
Consent Form

TITLE: Quality of Life in Chronic Obstructive Pulmonary Disease

PRINCIPAL INVESTIGATOR: Kathryn L. Anderson R.N., M.N. Doctoral Student, School of Nursing, Oregon Health Sciences University, Portland, OR. Telephone: 206-361-0777.

FACULTY ADVISOR: Carol S. Burckhardt, R.N., Ph.D. Associate Professor, School of Nursing, Oregon Health Sciences University, Portland, OR. Telephone: 206-494-3895.

PURPOSE: Quality of life is defined as the satisfaction that people have with their lives in the following areas: their physical and material well-being; relationships with other people; social and community activities; personal develop-ment and fulfillment; recreation; and independence. The purpose of this research study is to identify factors that affect the quality of life of people with chronic lung diseases (emphysema, chronic bronchitis, and asthma).

PROCEDURES: If I agree to participate, I will be interviewed for approximately one hour by the investigator named above. I will answer questions about the following: my occupational and educational history; the severity of my shortness of breath and how it affects my daily activities; the support I receive from other people; my mood, general outlook on life, and self-esteem; my quality of life. Some of the questions may be of a sensitive nature, such as questions about my mood.

I will be asked to walk for six minutes at my own pace as a measure of my exercise capacity. I may also be asked to perform a simple test of my lung function, known as a forced vital capacity, if this information is not available in my medical chart.

Consent Form

RISKS: There are no known risks of participation in this study. Sensitive questions may cause some psychological discomfort. A forced vital capacity maneuver may cause temporary shortness of breath. Walking for six minutes may cause muscle fatigue and temporary shortness of breath.

BENEFITS: I may not personally benefit from participation in this research study, but the knowledge gained from the study may benefit future patients by improving the nursing care they receive.

CONFIDENTIALITY: All of my answers will be seen only by the investigator and used only for research purposes. However, if the principal investigator finds evidence of serious mental or physical illness, she will discuss this information with me and my physician. The published report of the research will not show my individual results, but will show data that are combined with those of other participants. Neither my name nor my identity will be used for publication or publicity purposes.

COSTS: There are no costs involved in participating in this research study.

LIABILITY: It is not the policy of the U.S. Department of Health and Human Services or any agency funding the research project in which I am participating to compensate or provide medical treatment for human subjects in the event the research results in physical injury. The Oregon Health Sciences University, as an agency of the State, is covered by the State Liability Fund. If I suffer any injury from the research project, compensation would be available to me only if I establish that the injury occurred through the fault of the University, its officers, or employees. If I have further questions, I can call Dr. Michael Baird at 503-494-8014.

QUESTIONS: The investigator, Kathryn Anderson, has discussed the study plan with me and has answered my questions. If I have further questions, I can contact her at 206-361-0777.

Consent Form

RIGHT TO REFUSE OR WITHDRAW: My participation in this study is completely voluntary. I am free to refuse to participate or withdraw from the study at any time without jeopardizing my future medical care at Pulmonary Consultants or elsewhere.

I have been given a copy of this form and have had a chance to read it. My signature below indicates that I have read the foregoing and agree to participate in this study.

Signature: ______________________ **Date:** ___________

Signature of Investigator________________________________

APPENDIX F

Study Instruments and Protocols

Subject ID ___________

MENTAL STATUS EXAMINATION

First, I would like to ask you some questions to see if you are having any problems with your memory. Some of these questions may be difficult for you to answer, while others may seem easy. Please just do the best that you can.

1. **What is today's date?** *(Five points. If respondent gives an incomplete answer, prompt him/her for the missing data, e.g., "What season is it?")*

	Incorrect	Correct	
Year..............	0	1	MMSE1A___
Season...........	0	1	MMSE1B___
Date...............	0	1	MMSE1C___
Day................	0	1	MMSE1D___
Month...........	0	1	MMSE1E

2. **Where are you?** *(Five points, one for each correct answer and one bonus if all correct. If respondent gives an incomplete answer, prompt him/her for the missing data, e.g., "What city are we in?")*

	Incorrect	Correct	
State..............	0	1	MMSE2A___
County..........	0	1	MMSE2B___
City...............	0	1	MMSE2C___
Street............	0	1	MMSE2D___
(Bonus)........	0	1	MMSE2E___

3. **I am going to name three objects. I want you to repeat them after me and remember them.** *(Give one point for each correct answer, on the first trial only. Repeat objects until he/she learns all three. Count trials and record number.)*

	Incorrect	Correct	
Robin...........	0	1	MMSE3A___
Peach............	0	1	MMSE3B___
House..........	0	1	MMSE3C___
(# of trials) ___________			

4. **Spell the word "world" backwards.** *(One point for each correct letter. Record answer in spaces provided; if he/she omits a letter, count as one wrong. If rest of letters are in correct order, count as correct.)*

		Incorrect	Correct	
____	D..................	0	1	MMSE4A___
____	L....................	0	1	MMSE4B___
____	R..................	0	1	MMSE4C___
____	O..................	0	1	MMSE4D___
____	W.................	0	1	MMSE4E___

Subject ID ___________

MENTAL STATUS EXAMINATION

5. **What were those three objects I asked you to remember?** *(Give one point for each correct answer.)*

	Incorrect	Correct	
Robin............	0	1	MMSE5A____
Peach............	0	1	MMSE5B____
House...........	0	1	MMSE5C____

6. **What is this?** *(Show a pencil and a watch; score one point for each.)*

	Incorrect	Correct	
Pencil...........	0	1	MMSE6A____
Watch..........	0	1	MMSE6B____

7. **Repeat the following: "No `ifs', `ands', or `buts'".** *(one point)*

	Incorrect	Correct	
Statement.....	0	1	MMSE7 ____

8. **"Take this paper in your right hand; fold it in half and put it on the floor."** *(A three-stage command; three points. If needed, have them put the paper in their lap.)*

	Incorrect	Correct	
Takes paper in right hand......	0	1	MMSE8A____
Folds in half..........................	0	1	MMSE8B____
Puts on floor.......................	0	1	MMSE8C____

9. **Read and obey the following:** *(Show subject the written item on next page; one point)*

	Incorrect	Correct	
Command.................	0	1	MMSE9 ____

10. **Write a sentence; any sentence you want.** *(Give subject paper and pen. Score one point for any sentence that makes sense. Ignore spelling errors in scoring.)*

	Incorrect	Correct	
Sentence...................	0	1	MMSE10____

11. **I want you to draw a picture that looks just like this, anywhere on the page.** *(Hand subject a penc and the picture of two intersecting pentagons. Score one point if both figures are pentagons and they intersect in a four-sided figure.)*

	Incorrect	Correct	
Figure......................	0	1	MMSE11____

TOTAL POINTS _______ MMSETOT____

Subject ID ________

SHORTNESS OF BREATH

1. *(Hand subject the visual analogue scales.)* **I am going to ask you to make a vertical mark on a line like this** ***(point to top line)*** **that shows how you rate your shortness of breath. First, here is an example for practice. Suppose that you received a big property tax bill a week ago, and you are not sure you can afford to pay it. Mark the line at a place that indicates how worried you have felt over the past week about the tax bill.** *(Have subject make a vertical mark on the line. If he/she has trouble, give the second example.)*

2. **Here is another example. Suppose that noisy neighbors have awakened you several times each night for the last week. Mark the second line** ***(point to second line)*** **at a place that indicates how tired you have felt over the past week as a result of your disrupted sleep.** *(Have subject make a vertical mark on the line.)*

3. **Now I would like you to make a mark through the bottom line that indicates how severe your shortness of breath has been over the past week. So the question I have for you is: How severe has your shortness of breath been over the past week?** *(Have subject make a vertical mark on the third line.)*

Interviewer note: Rate subject difficulty in understanding instructions for VAS:

No difficulty.......................................	1
Slight difficulty....................................	2
Moderate difficulty.............................	3
Extreme difficulty................................	4

QUESTIONNAIRES

Now I have a series of questionnaires that I would like you to read and answer on your own. Or, if you prefer, I can read the questions to you.

(If respondent chooses to do on own, put the subject ID number on the first page and hand him/her the packet of questionnaires and a pencil.) **Please read through the questions and circle the number next to the answer that is most appropriate for you.**

(If respondent elects to have you read the questions, seat yourself next to the respondent, and proceed by reading questions to him/her. Note whether the questionnaire was read or self-administered.)

Were items self-administered? Yes
No

Subject ID ________

SHORTNESS OF BREATH

EXAMPLE 1: How worried have you felt *over the past week*?

Not at all
worried

Extremely
worried

EXAMPLE 2: How tired have you felt *over the past week*?

Not at all
tired

Extremely
tired

SHORTNESS OF BREATH: How severe has your shortness of breath been *over the past week*

Not at all
short of
breath

Shortness of
breath as bad as
as it can be

VASTOT_____

Subject ID __________

QUALITY OF LIFE

Please read each item and circle the number that best describes how satisfied you are at this time. Please answer each item even if you do not currently participate in an activity o have a relationship. You can be satisfied or dissatisfied with not doing the activity or having the relationship.

How satisfied are you with . . .

A. Material comforts—home, food, conveniences, financial security.

Delighted	7
Pleased	6
Mostly satisfied	5
Mixed	4
Mostly dissatisfied	3
Unhappy	2
Terrible	1

QOLSA_____

B. Health--being physically fit and vigorous.

Delighted	7
Pleased	6
Mostly satisfied	5
Mixed	4
Mostly dissatisfied	3
Unhappy	2
Terrible	1

QOLSB_____

C. Relationships with parents, siblings, and other relatives--communicating, visiting, helping.

Delighted	7
Pleased	6
Mostly satisfied	5
Mixed	4
Mostly dissatisfied	3
Unhappy	2
Terrible	1

QOLSC_____

Subject ID ________

QUALITY OF LIFE

How satisfied are you with . . .

D. Having and rearing children.

Delighted................................	7
Pleased..................................	6
Mostly satisfied.......................	5
Mixed....................................	4
Mostly dissatisfied....................	3
Unhappy................................	2
Terrible..................................	1

QOLSD_____

E. Close relationships with spouse or significant other.

Delighted................................	7
Pleased..................................	6
Mostly satisfied.......................	5
Mixed....................................	4
Mostly dissatisfied....................	3
Unhappy................................	2
Terrible..................................	1

QOLSE_____

F. Close friends.

Delighted................................	7
Pleased..................................	6
Mostly satisfied.......................	5
Mixed....................................	4
Mostly dissatisfied....................	3
Unhappy................................	2
Terrible..................................	1

QOLSF_____

G. Helping and encouraging others, volunteering, giving advice.

Delighted................................	7
Pleased..................................	6
Mostly satisfied.......................	5
Mixed....................................	4
Mostly dissatisfied....................	3
Unhappy................................	2
Terrible..................................	1

QOLSG_____

Subject ID __________

QUALITY OF LIFE

How satisfied are you with . . .

H. Participating in organizations and public affairs.

Delighted	7
Pleased	6
Mostly satisfied	5
Mixed	4
Mostly dissatisfied	3
Unhappy	2
Terrible	1

QOLSH_____

I. Learning--attending school, improving understanding, getting additional knowledge.

Delighted	7
Pleased	6
Mostly satisfied	5
Mixed	4
Mostly dissatisfied	3
Unhappy	2
Terrible	1

QOLSI_____

J. Understanding yourself--knowing your assets and limitations--knowing what life is about

Delighted	7
Pleased	6
Mostly satisfied	5
Mixed	4
Mostly dissatisfied	3
Unhappy	2
Terrible	1

QOLSJ_____

K. Work--job or in home.

Delighted	7
Pleased	6
Mostly satisfied	5
Mixed	4
Mostly dissatisfied	3
Unhappy	2
Terrible	1

QOLSK_____

Subject ID ________

QUALITY OF LIFE

How satisfied are you with . . .

L. Expressing yourself creatively.

Delighted................................ 7
Pleased.................................. 6
Mostly satisfied....................... 5
Mixed.................................... 4
Mostly dissatisfied................... 3
Unhappy................................. 2
Terrible.................................. 1

QOLSL_____

M. Socializing--meeting other people, doing things, parties, etc.

Delighted................................ 7
Pleased.................................. 6
Mostly satisfied....................... 5
Mixed.................................... 4
Mostly dissatisfied................... 3
Unhappy................................. 2
Terrible.................................. 1

QOLSM_____

N. Reading, listening to music, or observing entertainment.

Delighted................................ 7
Pleased.................................. 6
Mostly satisfied....................... 5
Mixed.................................... 4
Mostly dissatisfied................... 3
Unhappy................................. 2
Terrible.................................. 1

QOLSN_____

O. Participating in active recreation.

Delighted................................ 7
Pleased.................................. 6
Mostly satisfied....................... 5
Mixed.................................... 4
Mostly dissatisfied................... 3
Unhappy................................. 2
Terrible.................................. 1

QOLSO_____

5 .

Subject ID ________

QUALITY OF LIFE

How satisfied are you with . . .

P. Independence, doing for yourself.

Delighted................................	7
Pleased..................................	6
Mostly satisfied.......................	5
Mixed....................................	4
Mostly dissatisfied....................	3
Unhappy................................	2
Terrible..................................	1

QOLSP_____

QOLSTOT_____

Subject ID ________

DAILY FUNCTION

Here are some questions about your daily functioning over the PAST MONTH. Please circle the response that is most appropriate for you. There are *no* right or wrong answers.

These questions refer to MOBILITY LEVEL. During the *past month* . . .

A. How often were you physically able to drive a car or use public transportation?

All days........................ 1
Most days...................... 2
Some days..................... 3
Few days....................... 4
No days........................ 5

AIMSA_____

B. How often were you out of the house for at least part of the day?

All days........................ 1
Most days...................... 2
Some days..................... 3
Few days....................... 4
No days........................ 5

AIMSB_____

C. How often were you able to do errands in the neighborhood?

All days........................ 1
Most days...................... 2
Some days..................... 3
Few days....................... 4
No days........................ 5

AIMSC_____

D. How often did someone have to assist you to get around outside your home?

All days........................ 1
Most days...................... 2
Some days..................... 3
Few days....................... 4
No days........................ 5

AIMSD_____

E. How often were you in a bed or chair for most or all of the day?

All days........................ 1
Most days...................... 2
Some days..................... 3
Few days....................... 4
No days........................ 5

AIMSE_____

Subject ID ________

DAILY FUNCTION

These questions refer to WALKING AND BENDING. During the *past month* . . .

F. Did you have trouble doing vigorous activities such as running, lifting heavy objects, or participating in strenuous sports?

All days........................ 1
Most days..................... 2
Some days.................... 3
Few days...................... 4
No days........................ 5

AIMSF_____

G. Did you have trouble either walking several blocks or climbing a few flights of stairs?

All days........................ 1
Most days..................... 2
Some days.................... 3
Few days...................... 4
No days........................ 5

AIMSG_____

H. Did you have trouble bending, lifting, or stooping?

All days........................ 1
Most days..................... 2
Some days.................... 3
Few days...................... 4
No days........................ 5

AIMSH_____

I. Did you have trouble either walking one block or climbing one flight of stairs?

All days........................ 1
Most days..................... 2
Some days.................... 3
Few days...................... 4
No days........................ 5

AIMSI_____

J. Were you unable to walk unless assisted by another person or by a cane, crutches, or walker?

All days........................ 1
Most days..................... 2
Some days.................... 3
Few days...................... 4
No days........................ 5

AIMSJ_____

Subject ID ________

DAILY FUNCTION

These questions refer to SELF-CARE TASKS. During the *past month* . . .

K. Did you need help to take a bath or shower?

Always...........................	1
Very often.....................	2
Sometimes....................	3
Almost never.................	4
Never............................	5

AIMSK_____

L. Did you need help to get dressed?

Always...........................	1
Very often.....................	2
Sometimes....................	3
Almost never.................	4
Never............................	5

AIMSL_____

M. Did you need help to use the toilet?

Always...........................	1
Very often.....................	2
Sometimes....................	3
Almost never.................	4
Never............................	5

AIMSM_____

N. Did you need help to get in or out of bed?

Always...........................	1
Very often.....................	2
Sometimes....................	3
Almost never.................	4
Never............................	5

AIMSN_____

Subject ID ________

DAILY FUNCTION

These questions refer to HOUSEHOLD TASKS. During the *past month* . . .

O. If you had the necessary transportation, could you go shopping for groceries without help

Always	1
Very often	2
Sometimes	3
Almost never	4
Never	5

AIMSO_____

P. If you had kitchen facilities, could you prepare your own meals without help?

Always	1
Very often	2
Sometimes	3
Almost never	4
Never	5

AIMSP_____

Q. If you had household tools and appliances, could you do your own housework without help?

Always	1
Very often	2
Sometimes	3
Almost never	4
Never	5

AIMSQ_____

R. If you had laundry facilities, could you do your own laundry without help?

Always	1
Very often	2
Sometimes	3
Almost never	4
Never	5

AIMSR_____

AIMSTOT_____

Subject ID______________

SUPPORT

Here are some statements with which some people agree and others disagree. Please read each statement and circle the response most appropriate for you. There is *no* right or wrong answer.

A. There is someone I feel close to who makes me feel secure.

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree...........................	6
Strongly agree..............	7

PRQA_____

B. I belong to a group in which I feel important.

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree...........................	6
Strongly agree..............	7

PRQB_____

C. People let me know that I do well at my work (job, homemaking).

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree...........................	6
Strongly agree..............	7

PRQC_____

D. I can't count on my relatives and friends to help me with problems.

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree...........................	6
Strongly agree..............	7

PRQD_____

Subject ID__________

SUPPORT

E. I have enough contact with the person who makes me feel special.

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree............................	6
Strongly agree..............	7

PRQE_____

F. I spend time with others who have the same interests that I do.

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree............................	6
Strongly agree..............	7

PRQF_____

G. There is little opportunity in my life to be giving and caring to another person.

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree............................	6
Strongly agree..............	7

PRQG_____

H. Others let me know that they enjoy working with me (job, committees, projects).

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree............................	6
Strongly agree..............	7

PRQH_____

Subject ID__________

SUPPORT

I. There are people who are available if I needed help over an extended period of time.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral......................... 4
Somewhat agree.......... 5
Agree........................... 6
Strongly agree............. 7

PRQI_____

J. There is no one to talk to about how I am feeling.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral......................... 4
Somewhat agree.......... 5
Agree........................... 6
Strongly agree............. 7

PRQJ_____

K. Among my group of friends we do favors for each other.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral......................... 4
Somewhat agree.......... 5
Agree........................... 6
Strongly agree............. 7

PRQK_____

L. I have the opportunity to encourage others to develop their interests and skills.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral......................... 4
Somewhat agree.......... 5
Agree........................... 6
Strongly agree............. 7

PRQL_____

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Subject ID________

SUPPORT

M. My family lets me know that I am important for keeping the family running.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral........................ 4
Somewhat agree.......... 5
Agree.......................... 6
Strongly agree............. 7

PRQM_____

N. I have relatives or friends who will help me out even if I can't pay them back.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral........................ 4
Somewhat agree.......... 5
Agree.......................... 6
Strongly agree............. 7

PRQN_____

O. When I am upset, there is someone who lets me be myself.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral........................ 4
Somewhat agree.......... 5
Agree.......................... 6
Strongly agree............. 7

PRQO_____

P. I feel no one has the same problems as I.

Strongly disagree.......... 1
Disagree....................... 2
Somewhat disagree...... 3
Neutral........................ 4
Somewhat agree.......... 5
Agree.......................... 6
Strongly agree............. 7

PRQP_____

SUPPORT

Q. I enjoy doing little "extra" things that make another person's life more pleasant.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQQ_____

R. I know that others appreciate me as a person.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQR_____

S. There is someone who loves and cares about me.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQS_____

T. I have people to share social events and fun activities with.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQT_____

15 **Subject ID**__________

SUPPORT

U. I am responsible for helping provide for another person's needs.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQU_____

V. If I need advice there is someone who would assist me to work out a plan for dealing with the situation.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQV_____

W. I have a sense of being needed by another person.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQW_____

X. People think that I'm not as good a friend as I should be.

Strongly disagree..........	1
Disagree......................	2
Somewhat disagree......	3
Neutral........................	4
Somewhat agree..........	5
Agree..........................	6
Strongly agree.............	7

PRQX_____

Subject ID____________

SUPPORT

Y. If I got sick there is someone to give me advice about caring for myself.

Strongly disagree..........	1
Disagree.......................	2
Somewhat disagree......	3
Neutral.........................	4
Somewhat agree..........	5
Agree...........................	6
Strongly agree..............	7

PRQY_____

PRQTOT_____

Subject ID ________

SELF

Below are some statements about feelings. Please read each statement and circle the response that is most appropriate for you. There are *no* right or wrong answers.

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

Strongly disagree 1
Disagree.. 2
Agree... 3
Strongly agree.................................. 4

SESA_____

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

Strongly disagree.............................. 1
Disagree.. 2
Agree... 3
Strongly agree.................................. 4

SESB_____

C. I feel that I have a number of good qualities.

Strongly disagree.............................. 1
Disagree.. 2
Agree... 3
Strongly agree.................................. 4

SESC_____

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

Strongly disagree.............................. 1
Disagree.. 2
Agree... 3
Strongly agree.................................. 4

SESD_____

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

Strongly disagree.............................. 1
Disagree.. 2
Agree... 3
Strongly agree.................................. 4

SESE_____

F. I certainly feel useless at times.

Strongly disagree.............................. 1
Disagree.. 2
Agree... 3
Strongly agree.................................. 4

SESF_____

Subject ID ____________

18 .

SELF

G. I feel that I am a person of worth, at least on an equal plane with others.

Strongly disagree..............................	1	
Disagree..	2	
Agree..	3	
Strongly agree.................................	4	SESG_____

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

Strongly disagree..............................	1	
Disagree..	2	
Agree..	3	
Strongly agree.................................	4	SESH_____

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

Strongly disagree..............................	1	
Disagree..	2	
Agree..	3	
Strongly agree.................................	4	SESI_____

J. I take a positive attitude toward myself.

Strongly disagree..............................	1	
Disagree..	2	
Agree..	3	
Strongly agree.................................	4	SESJ_____

SESTOT_____

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Subject ID ________

LIFE ORIENTATION

Please indicate the extent to which you agree or disagree with the following items. Try to be as accurate and honest as you can be, and try not to let your answer to one question influence how you answer other questions. There are *no* right or wrong answers.

A. In uncertain times, I usually expect the best.

Strongly disagree.............................. 0
Disagree.. 1
Neutral... 2
Agree... 3
Strongly agree.................................. 4

LOTA_____

B. It's easy for me to relax.

Strongly disagree.............................. 0
Disagree.. 1
Neutral... 2
Agree... 3
Strongly agree.................................. 4

LOTB_____

C. If something can go wrong for me, it will.

Strongly disagree.............................. 0
Disagree.. 1
Neutral... 2
Agree... 3
Strongly agree.................................. 4

LOTC_____

D. I always look on the bright side of things.

Strongly disagree.............................. 0
Disagree.. 1
Neutral... 2
Agree... 3
Strongly agree.................................. 4

LOTD_____

E. I'm always optimistic about my future.

Strongly disagree.............................. 0
Disagree.. 1
Neutral... 2
Agree... 3
Strongly agree.................................. 4

LOTE_____

Subject ID ________

LIFE ORIENTATION

F. I enjoy my friends a lot.

Strongly disagree	0	
Disagree	1	
Neutral	2	
Agree	3	
Strongly agree	4	LOTF____

G. It's important for me to keep busy.

Strongly disagree	0	
Disagree	1	
Neutral	2	
Agree	3	
Strongly agree	4	LOTG____

H. I hardly ever expect things to go my way.

Strongly disagree	0	
Disagree	1	
Neutral	2	
Agree	3	
Strongly agree	4	LOTH____

I. Things never work out the way I want them to.

Strongly disagree	0	
Disagree	1	
Neutral	2	
Agree	3	
Strongly agree	4	LOTI____

J. I don't get upset too easily.

Strongly disagree	0	
Disagree	1	
Neutral	2	
Agree	3	
Strongly agree	4	LOTJ____

Subject ID ________

21

LIFE ORIENTATION

K. I'm a believer in the idea that "every cloud has a silver lining".

Strongly disagree	0	
Disagree	1	
Neutral	2	
Agree	3	
Strongly agree	4	LOTK_____

L. I rarely count on good things happening to me.

Strongly disagree	0	
Disagree	1	
Neutral	2	
Agree	3	
Strongly agree	4	LOTL_____

LOTTOT_____

Subject ID ________

MOOD

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the PAST WEEK, INCLUDING TODAY. Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. Be sure to read all the statements in each group before making your choice.

A. BDIA_____
0....... I do not feel sad.
1....... I feel sad.
2....... I am sad all the time and I can't snap out of it.
3...... I am so sad or unhappy that I can't stand it.

B. BDIB_____
0...... I am not particularly discouraged about the future.
1...... I feel discouraged about the future.
2...... I feel I have nothing to look forward to.
3...... I feel that the future is hopeless and that things cannot improve.

C. BDIC_____
0...... I do not feel like a failure.
1...... I feel I have failed more than the average person.
2...... As I look back on my life, all I can see is a lot of failures.
3...... I feel I am a complete failure as a person.

D. BDID_____
0...... I get as much satisfaction out of things as I used to.
1...... I don't enjoy things the way I used to.
2...... I don't get real satisfaction out of anything anymore.
3...... I am dissatisfied or bored with everything.

E. BDIE_____
0...... I don't feel particularly guilty.
1...... I feel guilty a good part of the time.
2...... I feel quite guilty most of the time.
3...... I feel guilty all of the time.

F. BDIF_____
0...... I don't feel I am being punished.
1...... I feel I may be punished.
2...... I expect to be punished.
3...... I feel I am being punished.

23 Subject ID __________

MOOD

G. 0...... I don't feel disappointed in myself. BDIG_____
1...... I am disappointed in myself.
2...... I am disgusted with myself.
3...... I hate myself.

H. 0....... I don't feel I am any worse than anybody else. BDIH_____
1...... I am critical of myself for my weaknesses or mistakes.
2...... I blame myself all the time for my faults.
3...... I blame myself for everything bad that happens.

I. 0...... I don't have any thought of killing myself. BDII_____
1...... I have thoughts of killing myself, but I would not carry them out.
2...... I would like to kill myself.
3...... I would kill myself if I had the chance.

J. 0...... I don't cry any more than usual. BDIJ_____
1...... I cry more now than I used to.
2...... I cry all the time now.
3...... I used to be able to cry, but now I can't cry even though I want to.

K. 0...... I am no more irritated now than I ever am. BDIK_____
1...... I get annoyed or irritated more easily than I used to.
2...... I feel irritated all the time now.
3...... I don't get irritated at all by the things that used to irritate me.

L. 0....... I have not lost interest in other people. BDIL_____
1...... I am less interested in other people than I used to be.
2...... I have lost most of my interest in other people.
3...... I have lost all of my interest in other people.

M. 0...... I make decisions about as well as I ever could. BDIM_____
1...... I put off making decisions more than I used to.
2...... I have greater difficulty in making decisions than before.
3...... I can't make decisions at all anymore.

Subject ID __________

MOOD

N. 0...... I don't feel I look any worse than I used to. BDIN_____
1...... I am worried that I am looking old or unattractive.
2...... I feel that there are permanent changes in my appearance that make me look unattractive.
3....... I believe that I look ugly.

O. 0...... I can work about as well as before. BDIO_____
1...... It takes an extra effort to get started at doing something.
2...... I have to push myself very hard to do anything.
3...... I can't do any work at all.

P. 0...... I can sleep as well as usual. BDIP_____
1...... I don't sleep as well as I used to.
2...... I wake up 1 - 2 hours earlier than usual and find it hard to get back to sleep.
3...... I wake up several hours earlier than I used to and cannot get back to sleep.

Q. 0...... I don't get more tired than usual. BDIQ_____
1...... I get tired more easily than I used to.
2...... I get tired from doing almost anything.
3...... I am too tired to do anything.

R. 0...... My appetite is no worse than usual. BDIR_____
1...... My appetite is not as good as it used to be.
2...... My appetite is much worse now.
3...... I have no appetite at all anymore.

S. 0...... I haven't lost much weight, if any, lately. BDIS_____
1...... I have lost more than 5 pounds.
2...... I have lost more than 10 pounds.
3...... I have lost more than 15 pounds.

I am purposely trying to lose weight by eating less. *(Circle one)* Yes
No

25 .

Subject ID __________

MOOD

T. 0...... I am no more worried about my health than usual. BDIT_____
1...... I am worried about physical problems such as aches and pains; or upset stomach; o
constipation.
2...... I am very worried about physical problems and it's hard to think of much else.
3...... I am so worried about my physical problems that I cannot think about anything else

U. 0...... I have not noticed any recent change in my interest in sex. BDIU_____
1...... I am less interested in sex than I used to be.
2...... I am much less interested in sex now.
3...... I have lost interest in sex completely.

BDITOT_____

Subject ID__________

MOOD

Below is a list of common symptoms of anxiety. Please read each item in the list carefully. Indicate *how much* you have been bothered by each symptom during the PAST WEEK, INCLUDING TODAY by circling the response most appropriate for you.

A.	Numbness or tingling...............	Not at all.............	0	
		Mildly.................	1	
		Moderately.........	2	
		Severely.............	3	BAIA_____
B.	Feeling hot..............................	Not at all.............	0	
		Mildly.................	1	
		Moderately.........	2	
		Severely.............	3	BAIB_____
C.	Wobbliness in legs...................	Not at all.............	0	
		Mildly.................	1	
		Moderately.........	2	
		Severely.............	3	BAIC_____
D.	Unable to relax.........................	Not at all.............	0	
		Mildly.................	1	
		Moderately.........	2	
		Severely.............	3	BAID_____
E.	Fear of the worst happening......	Not at all.............	0	
		Mildly.................	1	
		Moderately.........	2	
		Severely.............	3	BAIE_____
F.	Dizzy or lightheaded.................	Not at all.............	0	
		Mildly.................	1	
		Moderately.........	2	
		Severely.............	3	BAIF_____
G.	Heart pounding or racing..........	Not at all.............	0	
		Mildly.................	1	
		Moderately.........	2	
		Severely.............	3	BAIG_____

Subject ID_________

MOOD

H.	Unsteady	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIH_____
I.	Terrified	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAII_____
J.	Nervous	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIJ_____
K.	Feelings of choking	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIK_____
L.	Hands trembling	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIL_____
M.	Shaky	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIM_____
N.	Fear of losing control	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIN_____

Subject ID________

MOOD

O.	Difficulty breathing	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIO_____
P.	Fear of dying	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIP_____
Q.	Scared	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIQ_____
R.	Indigestion or discomfort in abdomen	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIR_____
S.	Faint	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIS_____
T.	Face flushed	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIT_____
U.	Sweating (not due to heat)	Not at all	0	
		Mildly	1	
		Moderately	2	
		Severely	3	BAIU_____

BAITOT_____

Descriptive Data SUBJECT ID ___________

These last questions ask about personal characteristics and socioeconomic status. (If subject looks tired, ask only the starred [*] questions.)

1. What is your race? (Read choices)

Caucasian	1
African American	2
Asian American	3
Hispanic	4
Native American	5
Mixed Race	6
(Prefer not to answer)	7
(Don't know)	8
(Blank)	9

*2. What is your marital status? (Read choices)

_____ Married, living with spouse
_____ Never married
_____ Divorced
_____ Separated
_____ Widowed

*a. If divorced: Do you receive financial support from your former spouse? Yes No

*b. If separated: Do you receive financial support from your spouse? Yes No

*c. If widowed: Do you receive financial support from your spouse's estate? Yes No

*3. Are you retired? Yes No

*a. If yes, ask What was the reason for your retirement?

____

*4. What is/was your occupation? (If there was more than one, ask What w the job you held for most of your working life?)

____

*5. Is your spouse retired? Yes No

*6. What is/was your spouse's occupation? ______________________________

Descriptive Data SUBJECT ID ___________

*7. What was the highest grade or year in school that you completed? (Re choices)

Less than seventh grade	1
Junior high school (ninth grade)	2
Partial high school (10th or 11th grade)	3
High school graduate (private, parochial, trade, or public)	4
Partial college (at least one year, or specialized training)	5
Standard college or university graduation	6
Graduate professional training (graduate degree)	7

*8. What was the highest grade or year in school that your spouse completed? (Read choices)

Less than seventh grade	1
Junior high school (ninth grade)	2
Partial high school (10th or 11th grade)	3
High school graduate (private, parochial, trade, or public)	4
Partial college (at least one year, or specialized training)	5
Standard college or university graduation	6
Graduate professional training (graduate degree)	7

9. What is the name you use for your lung problem? (If subject has trouble answering, give examples of emphysema, chronic bronchitis, asthma.)

____

10. How long have you known that you had (<u>use term patient gave above</u>)?

____

11. Do you ever use oxygen at home? Yes No

If yes, ask the following:

a. When did you first start using oxygen at home (date)? _________

b. What is your oxygen set on (how many liters/minute)? _________

c. How many hours a day do you use your oxygen? ___________________

d. What type of system do you use? (Read choices)

_____ nasal cannula
_____ intratracheal catheter (tunneled under skin)
_____ transtracheal catheter (mini-trach tube; SCOOP)

Descriptive Data SUBJECT ID ___________

12. Did you ever smoke cigarettes? Yes No

If yes, ask the following:

a. How many packs a day did you smoke? __________

b. How many years did you smoke? _________

c. Do you still smoke? Yes No

(1) If no, When did you quit? ___________

13. Have you ever attended a pulmonary rehabilitation program? Yes No

If yes, ask the following:

a. Which program did you attend? ________________________

b. When did you attend? ________________________

14. Do you belong to a lung club (e.g., Better Breathers, Lung Assoc.)

Yes No

If yes, ask the following:

a. Which club do you belong to? ____________________________

b. How often do you attend? ________________________

This is the end of the interview. I want to thank you for being willing share your time and thoughts with me.

TIME INTERVIEW ENDED ______________

Descriptive Data

SUBJECT ID ___________

Billing #___________

15. Gender Male 1
Female....2

GENDER ____

16. Height (inches; from old PFT record) ___________

17. ABGs Date ______________ Acute/Chronic? ______________

FiO2 ______________ HCO3 ______________

PaO2 ______________ pH ______________

PaCO2 ______________ SaO2 ______________

18. Medications (List all, with doses.)

19. Spirometry.

	Post-bronchodilator liters/% predicted
FVC	/
FEV_1	/
FEV_1/FVC	/

Spirometer: _____ Pneumotach
_____ Breon

FEV1% __

Technician: _____ KLA
_____ KJG Other (Name) ______________

Comments:

Spirometry Procedure

Once a day:

1. Check temperature and barometric pressure.

2. Turn on computer (switch on side). This also turns on printer. At C> type spiro; Operator: KA

3. Calibrate.
   a. Enter date, time, T, barometric P
   b. Attach air syringe. Select calibration procedure from Menu; run program while holding connection tight. Get help if necessary.

When you have a subject:

4. Seat patient comfortably. Attach new mouthpiece and have noseclip ready.

5. Enter subject data.
   a. Enter patient billing number from daily appointment schedule.
   b. Enter patient name and gender.
   c. Get DOB from Descriptive Data Form.
   d. Get height from previous PFT record in chart (see Descriptive Data Form).
   e. Physician = Quality of Life

6. Perform FVC.
   a. Instruct patient in forced vital capacity maneuver (FVC), ending with a maximal inspiration. Say: "When I tell you to begin, take in the biggest breath you can, then blow out as hard and as fast as you can. Keep blowing until I tell you to stop. When I say 'stop', take in the biggest breath that you can."
   b. Select Post-bronchodilator FVC from Menu.
   c. Attach noseclip. Have patient perform FVC.
   d. Graphed results will appear. When ready to do next FVC, select Overlay. (Don't do this until subject is ready.)
   d. Repeat two more times. Let patient rest as long as necessary between FVC maneuvers.
   e. After three good curves, or the best the person can do, select Accept. Have subject use inhaled bronchodilator if needed after completion of test.
   f. At next Menu, select 4: Best FEV_1 and best FVC.
   g. Select 1 (print one-page report) for a hardcopy of results.

7. Abstract results to codebook without identifying remarks. Record equipment and technician. Turn in original above Julie's computer for filing in patient chart.

QUALITY OF LIFE IN COPD

Protocol for Six-Minute Walk

1. After completion of interview and spirometry, give subject instructions for the walk test. "This is the last part of the study. Now we will go out into the hallway and I will ask you to walk as far as you can in six minutes. You may rest as often and as long as you like. The goal is to cover as much ground as you can in six minutes."

    a. Take blood pressure and heart rate and record.
    b. If subject uses oxygen, find out if s/he can carry own oxygen tank. Also, ask him/her if a higher flow rate is used with exercise. If so, set liter flow to the higher rate now.

2. In hallway, show subject start and turning points. Then say: "Start walking when I say 'go'. Remember that the goal is to cover as much ground as possible in six minutes. You may rest whenever you like and for as long as you need to. I will say 'stop' when the time is up. When I say 'stop', I want you to stop walking and stay where you are. Are you ready?"

3. Start timer and say 'Go' at the same time. Now do one of the following:

    a. If subject needs help to carry portable oxygen, walk behind him/her carrying the tank. Each time subject returns to starting end of the hallway, say "You are doing well" or "Keep up the good work".
    b. If subject does not have oxygen or can carry his/her own tank, remain at starting end of hallway. Each time subject returns to your end of the hallway, say "You are doing well" or "Keep up the good work".
    c. Use lap counter to record completion of each length.

If subject complains of chest pain, discontinue test immediately and have him/her sit down. Check vital signs and notify physician. If subject complains of shortness of breath or weakness, say "Take a rest now and when it passes, try to walk a little farther." If subject does not feel s/he can continue, stop the test; note distance walked and time elapsed.

Protocol for Six-Minute Walk

4. At two minutes, mark the distance subject has covered; note location and the direction s/he was headed.

5. At six minutes from the starting time, say "stop". Mark the place subject has stopped and which direction he/she was headed at the time.

6. Have subject sit down. Record BP and heart rate. Have subject rest until he/she feels recovered, or at least five minutes. At end of recovery period, remind subject to turn down oxygen flow rate, if appropriate.

7. After subject leaves, measure distance covered in final length and total the distance walked.

Subject ID ______

SIX-MINUTE WALK TEST

	BP	Heart Rate
Before walking		
After walking		
5 minutes after walking (prn)		

At two minutes:

Number of laps _____ x length of lap _____ = _____ ft.

length of last lap _____ ft.

TOTAL _____ ft./3.28

TOTAL _____ meters WALK2TST ___

At six minutes:

Number of laps _____ x length of lap _____ = _____ ft.

length of last lap _____ ft.

TOTAL _____ ft./3.28

TOTAL _____ meters WALK6TST ___

CARRIES OWN OXYGEN? Yes No N/A

COMMENTS/REASON FOR STOPPING/ACTION TAKEN:

If test stopped before 6 minutes: Distance ________ Time ________

APPENDIX G

A Priori Power Analysis

A Priori Power Analysis

Although the larger goal of this research study was to explore the relationship between all of the predictor variables and quality of life, one relationship of special interest was that between social support and quality of life. If social support was shown to be important in predicting quality of life for people with COPD, then nursing interventions could be targeted at improving that support. Therefore, a sample size was sought that would be large enough to detect the relationship between social support and quality of life.

Cohen (1988) provided a model for determining the necessary sample size when the unique variance of a set of variables (Set B, which in this case was social support) is being tested. The unique variance accounted for by Set B is partialled out from Set A (in this case, the remaining four mediating variables). The following assumptions were made:

(1) Based on Burckhardt's (1985) findings, the amount of variance in quality of life explained by all five mediators was expected to be approximately 40% ($R^2_{Y \cdot A,B} = .40$).

(2) Burckhardt (1985) found that social support explained four percent of the variance in quality of life, so $R^2_{Y \cdot A,B} - R^2_{Y \cdot A}$ was estimated to be .04 in this study.

(3) The level of significance was set at .05.

(4) Desired power to detect the relationship between social

support and quality of life was 80%.

Equation 9.2.3 (Cohen, 1988, p. 410) provided an estimate of the effect size:

$$f^2 = \frac{R^2_{Y \cdot A,B} - R^2_{Y \cdot A}}{1 - R^2_{Y \cdot A,B}}$$

$$f^2 = \frac{.04}{.60} = .07$$

According to Cohen (1988), this value for f^2 represents a small effect size for multiple regression.

Next, the non-centrality parameter was calculated:

$$\lambda = f^2(u + v + 1),$$

where u = the number of variables in Set B (u = 1 in this study), and v = N - u - w - 1 (w = the number of variables in Set A, which equals 4 in this study). N was estimated to be 120. Therefore:

$$v = 120 - 1 - 4 - 1 = 114, \text{ and}$$

$$\lambda = .07(1 + 114 + 1) = 7.98.$$

At this point, Table 9.3.2 (Cohen, 1988, pp. 420-423) was entered for u = 1, v = 114, and $\lambda = 8$. Interpolation between v = 60, for which power = .79, and v = 120, for which power = .80, yielded an estimated power of 80% to detect the effect of social support on quality of life with a sample size of 120.