Order Number 9029933

A test of a compliance model for prediction of smoking reduction in cardiopulmonary patients

Galizia, Virginia Jean, Ph.D.

City University of New York, 1990

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

A

A TEST OF A COMPLIANCE MODEL FOR PREDICTION OF SMOKING REDUCTION IN CARDIOPULMONARY PATIENTS

by

VIRGINIA J. GALIZIA

A dissertation submitted to the Graduate Faculty in Educational Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1990

This manuscript has been read and accepted for the Graduate Faculty in Educational Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

April 21, 1990
Date

Shirley Feldmann
Chair of Examining Committee

April 23, 1990
Date

Executive Officer

Supervisory Committee:

Shirley Feldmann, Ph.D.

David Rindskopf, Ph.D.

Barry Zimmerman, Ph.D.

The City University of New York

ABSTRACT

A TEST OF A COMPLIANCE MODEL FOR PREDICTION OF SMOKING REDUCTION IN CARDIOPULMONARY PATIENTS

by

Virginia J. Galizia

Advisor: Professor Shirley Feldmann

In health-related situations, patients respond to directions or suggestions according to their own subjective decisions. The outcome of these subjective responses, or health behaviors, may be defined in terms of compliance, or the adherence to a treatment regimen. A patient-centered approach to compliance involving the study of personality-related individual differences of persons with a chronic disease condition is the focus of this study.

The medical model fails to provide adequate educational intervention. Thus, a suggested procedure for better compliance is to describe the patient on the basis of his or her personal orientation towards health, e.g., the individual's locus of control, beliefs and values associated with his or her health and to develop patient education accordingly. A smoker who suffers from a serious heart or lung condition typically is expected to stop smoking to reduce the likelihood of further complications or recurrence of the condition, which may be fatal. In this study, health locus of control, health beliefs, health value, and the use of self-regulatory behaviors are tested in relation to compliance with smoking reduction; demographics and smoking history data are also discussed.

Seventy-one subjects who were known smokers suffering from a coronary (CHD) or pulmonary (COPD) disease completed the initial questionnaire and interview; 58 (29 CHD and 29 COPD) subjects completed the follow-up questionnaire and interview. Compliance was assessed via self-report and validated by significant other

reports. A biochemical analysis of saliva samples for thiocyanate levels was attempted but discontinued due to technical support errors.

A hierarchical multiple regression analysis was performed on the data to determine if the variables significantly contributed to the variation in smoking reduction in this patient population. The results did not support the model. Paired *t*-tests of the predictor variables resulted in a significant difference found in self-regulatory behaviors used at the first versus the second interview. A difference in smoking for the cardiac subjects approached significance. Overall, the cardiac subjects increased smoking over the study period while the pulmonary group decreased smoking slightly. Future research should attempt to modify the model and develop patient education accordingly.

ACKNOWLEDGEMENTS

This dissertation is dedicated to my parents: to the memory of my mother, Dorothy, who encouraged me in striving towards my goals; to my father, Vincent, who taught me the meaning in the pleasure of learning. I would also like to acknowledge the love and encouragement of my aunt and uncle, Elizabeth and S. John Galizia, whose help made so many burdens lighter during the last few years.

I am indebted to so many people who have made this endeavor possible. First, I would like to extend my appreciation to the faculty of the Educational Psychology Department of the Graduate Center of the City University of New York for the opportunity to pursue my goals. To my Committee members, Professors Shirley Feldmann, David Rindskopf, and Barry Zimmerman: your patience and guidance have been invaluable. I am especially grateful to Professor Feldmann for her dedication and emotional support. Many thanks to Professors Suzanne Ouellette Kobasa and Phil Saigh who graciously gave of their time to participate in my behalf as dissertation readers.

Secondly, I would like to thank all those who facilitated this research especially Dr. Harry Steinberg, MD, Chief of Pulmonary Medicine at Long Island Jewish-Hillside Medical Center and his staff, Jane Lucksinger and Edith Chernoff, whose understanding and assistance made much of this research possible. To the nurses on the Cardiac Unit at LIJ, especially Sue VanBueghem, RN-NCC, and to Bruce Kay, Director of Pharmacy and all the staff at LIJ, many thanks for their hospitality and assistance. A special thank you to former colleague, Brian Baker, Pharm.D., who helped me through the red tape procedures involved in institutional research.

I would also like to thank Dr. Dennis Bloomfield, MD, Medical Director of the Richmond Cardio-Pulmonary Care Center, who permitted me access to clients for this research and to Julie Weissglass Cohen, Director, for her kindness and invaluable assistance.

Special thanks to all the patients and their families who were kind enough to volunteer for this study and permit me to intrude in their lives. A beneficial side effect has been the number of wonderful people I have met through conducting this research.

Lastly, I would like to thank several friends and colleagues who have played significant roles in the successful completion of this research and in my journey through the doctoral maze:

Dr. Marylou McGanney who has been a constant source of insight, support and friendship; to her and Dr. Andrew Leon both of whom helped direct my statistical analyses with kindness and encouragement.

Drs. Robert B. Sause, Mitchel Levison and Irene Deitch whose guidance, support and concern have provided encouragement and motivation over the years.

To RBS - a long and happy life. I am so thankful you quit smoking and I look forward to many more years of collaboration and friendship.

To PFO - I only wish you had quit smoking. Rest in peace.

To the Faculty of the Educational, Developmental and Social Psychology Departments of the CUNY Graduate Center - you have taught me so much. I am indebted to you all.

TABLE OF CONTENTS

page

page

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

People, as complex individuals, react to various stimuli differently. In health-related situations, patients respond to directions or suggestions according to their own subjective decisions. The outcome of these subjective responses, or health behaviors, may be defined in terms of compliance, or the adherence to a treatment regimen. Compliance may involve medication as well as nondrug behavioral regimens such as caloric restrictions, exercise, or cessation of such negative health behaviors as smoking or abuse of alcohol or drugs. A patient-centered approach to compliance involving the study of personality-related individual differences of persons with a chronic disease condition is the focus of this study.

Patients are expected to comply with instructions given them by their physicians. When noncompliance occurs, the patient is quick to be blamed for defaulting. Compliance is more likely to occur if the patient's perspective of his or her illness, capabilities, and personal environment are taken into consideration. The decision to comply or not may depend upon the ease with which a change can be effected in conjunction with social, psychological and physiological variables. For example, Davis (1967) discusses compliance as a function of an individual's values, attitudes and membership in formal and informal social groups. Changes in personal and work habits, the influence of family and friends, disease characteristics, the doctor-patient relationship, and economic and demographic characteristics of the patient are representative of factors predicting compliant behavior in Davis' discussion.

The literature is replete with evidence that compliance rates are as low as 25%, attributing noncompliance to a variety of factors, such as those cited above, related to both the patient and the health care delivery system. "A major failing of the medical model is its inadequacy for educational intervention" (Leventhal, Zimmerman & Gutmann, 1984, p. 375). Education can alter compliance when it is directed toward the

processes underlying the perception or representation of the health problem as well as toward the processes controlling planning and action of treatment.

It is suggested that one possible procedure for better compliance is to describe the patient on the basis of his or her personal orientation towards health, e.g., the individual's locus of control, beliefs and values associated with his or her health. If patient education were to address the needs of the patient on the basis of these individual differences, an improved rate of compliance may result.

Rotter (1966) argued that if his analysis of locus of control and reinforcement was correct, different kinds of learning paradigms or situations would produce different kinds of learning functions. Therefore, learning under skill conditions is different from learning under chance conditions. This theory relates to the notion that individual differences, as a contextual variable, will affect learning and subsequent behaviors (e.g., compliance) since people attribute personal control to reward differently in the same situation. Thus, reinforcement and learning would occur according to the needs of the individual which would require patient education to be developed and used subjectively if it is to effectively promote compliant behavior.

This research studied how certain personality characteristics, beliefs and values may affect compliance, specifically, instructions to patients with a history of cardiopulmonary disease to stop smoking. The health locus of control, health beliefs and value placed on health by these patients is assessed to determine their effect on compliance behaviors. Locus of control is typically divided into a two-dimensional construct: internal-external control of reinforcement, or the degree to which a person perceives events happening to him or her to be dependent on his or her own behavior (internals) or as a result of luck, chance, fate, powerful others, or powers beyond one's personal control (externals). A three-dimensional approach to locus of control in health has been developed (Wallston, Wallston & DeVellis, 1978) that distinguishes between internal health locus of control individuals, those individuals who place

emphasis on powerful others affecting outcomes, and those who believe outcomes are influenced by chance. This Multidimensional Health Locus of Control Scale (MHLC) is used in this study as it is more applicable in health-related situations than the more general locus of control construct (Rotter, 1966).

The Health Belief Model (HBM) was developed to identify an individual's beliefs in health-related conditions that might predict their ultimate actions or health behaviors. Constructs within the model, such as perceived susceptibility to and seriousness of a disease, perceived benefits and costs of taking action, are pertinent to the study of compliance and form the basis of determining the health beliefs of individuals who should reduce or quit smoking. The value one places on his or her own health can affect health behaviors. For example, individuals who value their health highly are more likely to perform health behaviors, such as complying with treatment instructions, than people who do not value health highly.

The self-regulation, or processes used in self-management and control, of a negative health behavior such as smoking is incorporated into this study as it pertains to compliance. To maintain oneself in a relatively healthy state, compliance with a treatment protocol may be required, as with smoking reduction or cessation. Based on a patient-oriented frame of reference, the effect of underlying variables (health locus of control, health beliefs, health value and self-regulatory behaviors) on compliance with treatment instructions are studied. The predictability of compliance with reduction in smoking is tested by building a model related to chronic disease states via a theoretical and empirical groundwork based upon psychological rather than medical theory. A determination is made of the predictive ability of a set of variables that describe if patients comply with specific treatment as well as their perceptions of illness in order to aid in future development of patient education.

Smoking, a known correlate of cardiovascular disease (CVD) and chronic obstructive pulmonary (or lung) disease (COPD or COLD), is the compliance behavior in

question. A smoker who suffers from a serious heart or lung condition typically is required to stop smoking to reduce the likelihood of further complications or recurrence of the condition, which may be fatal. It would be expected that patients with cardiopulmonary disease who smoke and who have knowledge of the consequences of smoking on their condition are likely to comply with instructions to cease smoking. This premise is the underlying concept for compliance in this study. The decision to comply and the success of complying is studied on the basis of the individual's health locus of control, health beliefs, health values and self-regulatory behaviors initially used to comply.

REVIEW OF THE LITERATURE

The review of the literature encompasses the underlying theories from which the variables used in this study have been derived. Empirical evidence for these variables and their integration with each other will be presented as well as the rationale for their utilization in health-related research. Attribution and helplessness are discussed as the basis for the locus of control construct. The Health Belief Model is presented as the root for health beliefs. In addition to review of the value of health and self-regulation literature, research concerning smoking and chronic cardiopulmonary disease is discussed. The literature regarding compliance is discussed throughout this section as it relates to each of the variables presented.

REPRESENTATION: ATTRIBUTION AND HELPLESSNESS

Attributions concern perceptions pertaining to causality and are the basis for cognitive error and idiosyncratic approaches to the world (Heider, 1958). Heider associates task difficulty, effort, and intention (goal or outcome) with attribution. He describes opportunity and luck as temporary states in the environment. For example, a person may wait until a good opportunity arises before reaching a goal or may succeed because he or she feels "lucky" when an environmental force in the direction of a goal is maximum (or, vice versa, when an opposing force is minimal). When success is attributed to luck or opportunity, two things are implied: (1) the environmental conditions rather than the person are considered primarily responsible for the outcome, and (2) these environmental conditions are the product of chance (when attributing success to luck). Further, different conditions, such as consistency or variability of performance, are involved with luck. For example, few successes after many trials are often associated with luck whereas few failures with many successes would be attributed to bad luck or temporary personal factors. In this case, the unusual is attributed to luck

and not to the permanent character of the individual or his or her abilities. From this basis, Heider laid the cornerstone of attribution theory with his emphasis on perception of the locus of causality for achievement based on the Gestalt notion of perceptual organization being applied to the perception of other persons and their behavior.

Helplessness is the psychological state that frequently results when events are uncontrollable or when the outcome of an event is independent of one's voluntary responses (or those responses which can be modified by reward and punishment). If a person believes events are uncontrollable, the effects of reward and punishment on his or her voluntary responses are negated as the individual no longer believes any response made can affect the outcome. Thus, the motivation to initiate voluntary responses is undermined and the individual's perception of control is distorted. "Learned helplessness produces a cognitive set in which people believe that success or failure is independent of their own skilled actions, and they therefore have difficulty learning that responses work" (Seligman, 1975, p. 38).

Dweck (1975) defines learned helplessness as the learning or perception of independence between one's behavior and the presentation and/or withdrawal of aversive events. The important variable in learned helplessness is not the occurrence of the aversive event per se but the perception of the relationship between one's behavior and the occurrence of the event.

Helplessness effects are a specific reflection of more general principles of behavioral self-regulation: the giving up or reassertion response to uncontrollable outcomes appears to depend upon whether or not subjects expect to be able to produce the desired outcome when attempting the task in question. Both reassertion and giving up responses are influenced by self-directed attention. In addition, various performance impairments associated with helplessness are derived from a withdrawal impulse, more mental than physical (Carver & Scheier, 1981; 1982).

Maladaptive behavioral changes as well as successful normal activity is rooted in expectancy, as emphasized by Carver and Scheier (1982). Based on theory for therapeutic intervention for maladaptive behavior, they contend that people who are convinced that there will be no change no matter what they do will make little effort to create change.

Self-perceptions about self-regulatory abilities, as discussed by Bandura (1986), link successful health behaviors with positive self-judgments and attributions. Bandura goes on to relate beliefs in personal determination to either a sense of efficacy and power or one of apathy. In discussing self-management responses and individual differences in children, Copeland (1982) relates attributional style to locus of control and determination of outcomes, for example, successes being attributed to one's positive qualities and failures to lack of effort and ability.

No empirical evidence has been uncovered in connection with the learned helplessness paradigm and, specifically, compliance behavior with smoking by persons with cardiopulmonary disease. However, learned helplessness and attribution theory have been generalized to locus of control theory which has been used extensively in research associated with health behaviors. In the literature, the paradigm is associated with depression and coronary heart disease in relation to coping, recovery, and also personal control (Krantz & Schulz, 1980). Attribution and successful health behaviors, such as smoking and weight reduction, have been linked to self-efficacy and internal locus of control conditions (Chambliss & Murray, 1979a; 1979b). Further discussion of locus of control theory and research follows.

LOCUS OF CONTROL

Rotter (1966) considers the variable of internal-external (I-E) control of major significance in understanding the nature of learning processes in different kinds of learning situations relative to his social learning theory. He hypothesized that consistent

individual differences exist among individuals in the degree to which they are likely to attribute personal control to reward in the same situation. He contends that I-E control of reinforcement illustrates many possible variables that may play a significant role in the determination of behavioral choice in a variety of important life situations (Rotter, 1972).

Rotter defined internal (I) control as when "the person perceives that the event is contingent upon his own behavior or his own relatively permanent characteristics" (1966, p. 1). He defined external (E) control as:

> When reinforcement is perceived by the subject as following some action of his own but not being entirely contingent upon his action, then, in our culture it is typically perceived as the result of luck, chance, fate, as under the control of powerful others, or as unpredictable because of the great complexity of the forces surrounding him. (1966, p. 1)

For Rotter (1982), external control situations were those situations in a particular culture which produced the belief that the reinforcement was under outside control. Internal control situations were those in which there was a belief that reinforcement was under the subject's own control. Thus, contingent reinforcement is an important factor for the recurrence of behavior of the internal person and less important for the external individual.

On the basis of locus of control (LOC) theory, then, internals differ from externals in several ways. Subjects who have large changes in expectations reflect internal control whereas those who have small changes in expectations reflect external control (Abramson, Seligman & Teasdale, 1978). Internals feel that they control their own destiny and are the effective agents in determining the occurrence of reinforcements. They are believed to create their own performance criteria, use cues from multiple sources (e.g., external feedback and task attributions) in self-reinforcement decisions, and use less negative and more positive self-reinforcement and evaluations. Externals

feel that forces beyond their control are the essential factors in determining the occurrence of reinforcements. They depend on externally produced criteria (especially in ambiguous contingency situations), place greater emphasis on external feedback, and use less positive self-reinforcement and evaluations (Phares, 1972; Sandler, Reese, Spencer & Harpin, 1983).

Rotter (1982) claims that the greatest number of applications of social learning theory (SLT) is in work done on internal versus external control in the field of medical rehabilitation, where internals have been shown to do better at recovery and functioning than externals. In reviews of the literature, Strickland (1978) and Wallston and Wallston (1978) discussed a number of studies showing that internals are more likely to take responsibility for their actions. For example, Strickland found that internals are more likely to perform positive health behaviors such as seeking information about health maintenance when they value their health (Wallston, Maides & Wallston, 1976; Wallston, Wallston, Kaplan & Maides, 1976), that they learn more about their ailments when stricken with a life-threatening disorder such as tuberculosis (Seeman & Evans, 1962), and that they are more likely to attempt to protect their health and guard against risk in relation to heart disease. Research has demonstrated that people who do not smoke and people who have stopped smoking are more internal than smokers (Coan, 1973; Hjelle & Clouser, 1970; James, Woodruff & Werner, 1965; Straits & Sechrest, 1963).

Rotter's locus of control theory and scale has not proven successful in compliance studies due to the generalized expectancies it promotes (Benfari & Eaker, 1984; Hjelle & Clouser, 1970). The development of health locus of control measures have proven more applicable in compliance research relative to the specific context of locus of control in a health-related situation. A discussion of these measures will follow in the next section.

In contrast to Rotter's theory that LOC determines outcome expectancy, Heckhausen and Weiner (1974) state that LOC determines the affect associated with an outcome. For example, self-reward is heightened when success is attributed to effort; attributing failure to lack of effort is associated with the greatest amount of self-punishment. Weiner (1974a) examines some of the conceptual inadequacies of Rotter's LOC theory, especially as they relate to expectancy shifts. LOC, or the allocation of responsibility for an outcome to either the self (as internal or personal factors) or environmental (external) causes, is thought to affect the strength of the generalized expectancy of reinforcement.

Greene (1985) cites three motivational differences between locus of control and attribution theory: (1) the meaning of perceived control, (2) the distinction between ability and effort (as in academic motivation), and (3) the role of incentive value in motivational processes. She defines perceived control, within locus of control and social learning theory, as the "perceived instrumentality of behavior in attaining desired outcomes and is not differentiated from perceived contingency" (Greene, 1985, p. 66). This is in direct contrast to attribution theorists, such as Weiner, who view contingency and control as separate causal dimensions. Greene explains locus of control in terms of actions and outcomes as distinguished from controllability defined as perceived personal control over actions and outcomes. In addition, attribution theory distinguishes between effort and ability by considering effort to be controllable and ability not controllable. Lastly, achievement behavior in locus of control theory is influenced by incentive value, whereas this construct has no function in attribution theory.

With regard to locus of control, large changes in expectations are associated with internal control versus small changes in expectations with external control. Abramson, Seligman and Teasdale (1978) view the reformulation of the learned helplessness model as external locus of control being orthogonal to helplessness: one can be either internally or externally helpless.

According to Bandura (1982), Seligman and his colleagues shift causal locus of detrimental effects from belief that one's performances will go unrewarded to belief that one cannot produce the performances. This theory, then, singles out three dimensions in causal judgments of failure: internality (internal or external locus of control factors ascribed to failure), stability (enduring or transient causes), and generality (causes operating in many or one situation).

In a study comparing social learning and attribution theory, Weiner, Nierenberg and Goldstein (1976) found contrasting results between the two in relation to expectancy of success and motivation. Social learning theory specifies that expectancy is influenced by the locus of control of causal factors whereas attribution theory specifies that expectancy is influenced by the stability of causal factors. Locus of control refers to a causal belief and represents a dimension associated with the encoding of the causal structure of one's world. The results of this study show that stability of causal attributions, and not their locus of control, is related to expectancy of success. Thus, Weiner, Nierenberg and Goldstein believe that locus of control is not directly related to social learning theory and reinforcement expectancy but should be considered in a broader cognitive framework, that is, coming from more diffuse areas rather than from a single theoretical base.

Hiroto (1974) conceives internal-external control of reinforcement to be conceptually similar to the learned helplessness processes, each viewing control of reinforcement as a crucial variable. In his studies, he has found externals to have greater impairment in escapability than internals. He suggests a single process underlies learned helplessness, reactive depression, externality, and perception of chance: the expectancy that responding and reinforcement are independent.

Buss and Finn (1987) classify locus of control as a content, social-cognitive personality trait of the self, associated with self attributions. Locus of control has also been referred to as a causal belief and represents a dimension associated with the

encoding of the causal structure of one's world (Weiner, Nierenberg and Goldstein, 1976). Causal ascriptions of behavior to skill or chance can mediate the effects of performance attainments on self-efficacy (Bandura, 1977).

This study looks at locus of control in relation to causal beliefs and resulting behaviors. For example, individuals who believe they can affect change in their health will attempt to do so whereas those who believe health is externally controlled would be less inclined to take action to control their health, believe they do not have the ability to control it, may develop a helpless attitude toward good health and not be required to risk success or failure in compliant behaviors.

When success is attributed to luck or opportunity, two things are implied: (1) the environmental conditions rather than the person are considered primarily responsible for the outcome, and (2) these environmental conditions are the product of chance when attributing success to luck (Heider, 1958). Carver and Scheier (1981) state that attributions are relevant to behavior only to the degree that they influence expectancy. Interestingly, they postulate that egotism is related to learned helplessness and locus of control regarding threat to self-esteem. People will protect their self-esteem by not trying an attainment response, thus attributing failure to lack of effort rather than to lack of ability. They thus avoid blame by attributing failure externally. Conversely, self-esteem is enhanced when a person takes credit for the success, attributing it internally. Weiner's (1974b) interpretation of learned helplessness ascribes failure to low ability whereas attributing failure to lack of effort intimates that success is possible.

Health Locus of Control

The concept of locus of control from social learning theory is particularly pertinent to health behaviors and perceptions, according to Levenson (1981). The locus

of control construct in health-related situations can be functionally applied to the adoption of sick role behaviors, to the use of preventive measures, to the development of addictions or habits, to the receptivity to medical regimens, and to the recovery from disease processes or accidents. In general, the literature shows that internals are more likely to assume responsibility for their health and attempt to maintain their physical well-being to a greater extent than externals (Kaplan & Cowles, 1978; Lewis, Morisky & Flynn, 1978; McCusker & Morrow, 1979; Seeman & Evans, 1962; Shipley, 1981; Smith, 1970; Wallston, Maides & Wallston, 1976; Wallston, Wallston, Kaplan & Maides, 1976).

In one of the first applied studies of personal control in a health-related situation, Seeman and Evans (1962) proposed that an individual's generalized expectancies for control of events are relevant to performance; in this case, the performance was the individual's response, in terms of a sense of powerlessness, with regard to knowledge of tuberculosis when institutionalized for treatment of this disease. They concluded that those who are luck or fate oriented are more likely to be passive and less inclined to seek information since seeking information is associated with the notion that it is within one's own capacity to control events through knowledge. Thus, the subject's sense of personal control (or powerlessness) is a factor in determining the degree of knowledge and level of interest he took in his condition.

Using an atypical sample, Smith (1970) studied neuropsychiatric patients to determine changes in locus of control as a function of life crisis resolution. Via Rotter's I-E Scale, patients in crisis showed a significant change from external to internal locus of control scores after a life crisis resolution period as compared to patients in a noncrisis group, $t(23) = 2.87$, $p<.01$. Smith concluded that resolving the crisis increases the use of more effective coping mechanisms. Further, Smith identifies this study as providing construct validation of the I-E Scale.

In a self-control model of addictive behaviors, Marlatt and Parks (1982) describe the patient as one who goes from being a "client" in therapy to an individual assuming responsibility for the process of change. Preference for a more active role in the treatment is associated with an internal locus of control and personality orientation. In this model, treatment ranges from abstinence to controlled or moderate use of the addictive substance. In comparison, the disease model views the individual as a victim of forces (as in addiction) beyond one's personal control. In this model, preference is for a more passive role in treatment, which is usually total abstinence, similar to an external locus of control orientation.

Studies using health locus of control in relation to compliance have shown internals performing more compliant behaviors for improved health than externals. Kaplan and Cowles (1978) showed internals succeeded more than externals in smoking reduction. In another smoking study, Shipley (1981) found internals abstained from smoking better than externals. Lewis, Morisky and Flynn (1978) found that individuals with a greater internal orientation and perceived level of home care assistance were more compliant in taking their medication. Other studies have not been as successful in supporting this relationship. Nagy and Wolfe (1984), in a study of cognitive predictors of compliance in chronic disease patients (diabetes, hypertension, and respiratory diseases), found no relationship between compliance and health locus of control. Wallston, Wallston, Kaplan and Maides (1976) found only internals who valued health highly to perform information seeking behaviors in relation to health. A similar finding resulted in Kaplan and Cowles' (1978) study with internals high in health value smoking significantly fewer cigarettes than all other subjects.

In a review of the literature, Sandler, Reese, Spencer and Harpin (1983) discussed the interaction of locus of control in certain person-centered situations. For example, internals behave in ways that do not exacerbate their condition, are more cooperative and more actively involved in survival than externals. It was suggested that

heart attack victims may be moderated by personality characteristics such as locus of control and that externals may be associated with behavioral responses that foretell poor prognosis in those suffering from particular diseases.

Various health locus of control instruments have been developed to measure internal and external health beliefs and perception of control (Kirscht, 1972; Lau, 1982; Levenson, 1973; Wallston, Wallston & DeVellis, 1978; Wallston, Wallston, Kaplan and Maides, 1976). Though not always resulting in significant differences between the groups studied, these scales have been more useful in predicting health behaviors than Rotter's I-E Scale. More complete descriptions of these instruments and the Multidimensional Health Locus of Control Scale (MHLC) chosen to be used in this research are described in the Methodology section. The MHLC, a general assessment instrument specifically designed for use within medical population samples to examine health-relevant individual differences, is broken into three subscales: internal (IHLC), chance (CHLC), and powerful others (PHLC), where chance and powerful others represent the generalized external dimension.

The construct validity of health locus of control scales (e.g., "Do the scales measure a person's beliefs about the locus of control of their health?") are less certain than the reliability data. Wallston and Wallston (1981) state that when health locus of control is conceived as a dependent variable, there is greater validity of the measures than when the construct is used as a predictor of behavior. However, further clarification is needed since little data is available linking health locus of control beliefs to specific behaviors in specific situations.

From an extensive review of the literature, Wallston and Wallston (1981) found that certain groups of individuals show characteristic health locus of control tendencies. For example, individuals exhibiting preventive health behaviors (e.g., smoking reduction) and college samples are mostly internal as well as middle to upper middle class in social status. Blacks and older adults tend to be somewhat more external than

whites or younger subjects, respectively. Less educated and lower SES samples also tend to express more external beliefs.

In normative data presented with the use of the MHLC Scale (Wallston & Wallston, 1981), chronically ill patients show low internal health beliefs but high external beliefs (both chance and powerful others), as might be expected. Healthy adults show greater beliefs in powerful others and lower beliefs in health internality than do college students. Persons engaged in preventive health behaviors showed the greatest health internality than the previously mentioned groups. Little empirical data supporting compliance research using the MHLC is available since older scales have been utilized which do not incorporate the powerful others dimension. The internal dimension was shown to be associated with desired behaviors, in general, but adherence to treatment regimens was related to external beliefs. These results are difficult to interpret since it would appear logical if powerful others was identified as the external dimension in question; these results however were summarized from a two-dimensional scale (I versus E). Use of the MHLC scale should be a better predictor of this finding in terms of measuring powerful others externality. Wallston and Wallston (1981) also note that health locus of control measures used with medical patients present some significant findings, which has not been the case when nonpatient populations have been studied.

Locus of Control and Smoking

Some studies have utilized Rotter's I-E Scale (Benfari & Eaker, 1984; Best, 1975; Best & Steffy, 1975; Hjelle & Clouser, 1970) or some other generalized LOC measure (James, Woodruff & Werner, 1965; Straits & Sechrest, 1963); they identify smokers as being more external than nonsmokers, or that internals are more likely to engage in smoking abstinence or reduction than externals. A health locus of control measure was used in only a few studies in which the findings were similar. Shipley

(1981) found internals were more abstinent from smoking than chance (CHLC) subjects, and subjects not believing that powerful others could influence their health tended not to reduce smoking or smoked more when cessation intervention was used. Individuals believing in powerful others (PHLC) showed no differences in smoking patterns. Externals were found to be associated with more recidivism than internals (Horwitz, Hindi-Alexander & Wagner, 1985) and internals who valued health highly reduced smoking and maintained this change better than externals (Kaplan & Cowles, 1978). In addition, social support and behavioral coping measured at follow up have been found to be more important as factors in maintenance of nonsmoking than when measured at a pretreatment (entry) stage (Horwitz et al., 1985).

In this study, an attempt is made to show how a measure of health-related locus of control, when combined with other related variables, might predict a change in smoking behavior. Wallston and Wallston (1981) strongly recommend the use of measures of health value and beliefs in conjunction with health locus of control measures in order to better show a relationship to smoking reduction.

THE HEALTH BELIEF MODEL

The Health Belief Model (HBM), developed by the U.S. Public Health Service in the 1950s to look at disease prevention, is probably the most widely known psychosocial medical model of patient behavior (see Figure 1). It identifies characteristics of the patient, the therapeutic regimen, and the illness, based on perceptions and beliefs. Variables of the model were influenced by Lewinian theory (positive or negative valence given to various aspects of an individual's lifespace), dealing with the subjective world of the individual and not the objective world of the physician (Rosenstock, 1966). The psychological theories of Tolman, Rotter and Atkinson, among others, have influenced the HBM as well in terms of behavioral outcomes.

Maiman and Becker (1974) provide an extensive review of the historical aspects of the HBM relative to psychological theory which is summarized here. Lewin's goal setting construct is analogous to the desire to attain or maintain a positive state of health or avoid illness. Tolman's notion of performance behavior involves valence, expectations, subjective probability, and motivation or drive. Valence, for Tolman, is related to incentive valence of the objective or goal. Expectations are related to the individual's estimate of the likelihood of success, equivalent to Lewin's valence and subjective probability. Motivation is defined by Tolman as a "need-push" variable. Regarding the HBM, Tolman's incentive value (valence) is analogous to lowering susceptibility and severity to disease. Estimate of benefits relates to expectancy of success, and motivation is analogous to achieving or maintaining a positive state of health.

For Rotter, social learning theory is based on previous experience where a particular behavior has been reinforced and the individual has learned that this reinforcement occurs following the behavior. Rotter (1954) defines expectancy as the individual's subjective estimate that a particular reinforcement will occur as a result of a particular behavior in a particular situation. Reinforcement value, for Rotter, is the degree of preference for the occurrence of any reinforcement given equal probability of occurring. Lastly, behavioral potential is defined as the potential for any behavior to occur in any given situation in relation to one or more reinforcements. Thus, reinforcement value is analogous to the goal of a positive state of health or reduced susceptibility or severity. The constructs of benefits minus costs may be associated with expectancy while the occurrence of reinforcement is analogous to motivation in the HBM. Behavioral potential is equivalent to the likelihood of taking action in the model.

Atkinson's achievement motivation theory involving risk-taking behavior coincides with incentive value for success (positive) or failure (negative) in relation to attaining or maintaining a positive state of health (achieving success) or avoiding a state of illness

(avoiding failure), especially with regard to estimation of benefits and costs of health action. In a broader sense, the HBM has been referred to as a social learning model (Leventhal, Zimmerman & Gutmann, 1984) and as a cognitive behavioral model (Kendall & Turk, 1984) in relation to sickrole behavior (see Figure 2).

The original HBM included two class variables: (1) the psychological state of readiness to taking specific action and (2) the extent to which a particular course of action is believed to be beneficial in reducing the threat of illness. Rosenstock (1966) defines readiness in terms of the model's variables of vulnerability or susceptibility to disease as well as the seriousness of consequence from the disease. He, therefore, believes that readiness is defined in terms of the individual's point of view about susceptibility and seriousness rather than from the professional's view of reality. Further, he sees readiness as composed of both cognitive and affective elements but considers the emotional elements are of greater value in accounting for behavior than the cognitive elements.

The model evolved to place cognitive emphasis on perceptions of illness, modified by some of the originators and divided into the following areas:

1. Individual perceptions: perceived susceptibility to and severity of disease
2. Modifying factors: demographic and sociopsychological variables, perceived threat of disease, and cues to action
3. Likelihood of action: perceived benefits of and barriers to preventive action.

The Health Belief Model is used for predicting and explaining compliance behaviors via general health motivations, resusceptibility to illness, general faith in the physician and medical care, and characteristics of the doctor-patient relationship (Becker, 1974; Becker, Maiman, Kirscht, Haefner, Drachman & Taylor, 1979). According to this model, even when a person recognizes personal susceptibility to disease, action will not occur unless he or she also believes that becoming ill would

bring serious repercussions, thus emphasizing personal subjective perceptions of the severity of illness rather than medical estimates (Becker, 1974).

According to Wallston and Wallston (1984), research utilizing the Health Belief Model rarely includes all the component variables. The susceptibility and severity components, in relation to negative components of attitude toward nonaction, can be considered as motivational factors (e.g., "If I don't do X, I am increasing my chances of Y.") They feel that, as a health threat or health concern (vulnerability), motivation is a consistent component of the Health Belief Model. They have redefined health belief variables according to more general labels: (1) benefits and costs as attitude, (2) susceptibility and severity as vulnerability and threat, (3) concern and previous health behavior as motivation, and (4) cue to action as habit facilitating conditions.

The Health Belief Model and Smoking

The hazards of smoking and smoking behavior have been assessed by several studies. West, Graham, Swanson and Wilkinson (1977) measured the perception of a nonspecific threat of smoking and determined that when one sees cigarette smoking as a personal threat affecting his or her health, the individual is somewhat more likely to modify his or her smoking behavior. In a study of health beliefs regarding smoking, Weinberger, Greene, Mamlin and Jerin (1981) reported that moderate smokers (those individuals who smoked less than 10 cigarettes a day) believed smoking to be a serious health threat but did not see themselves as susceptible to health problems caused by cigarette smoking. These researchers posit that, in order to quit, it is not sufficient for people to believe smoking is a serious health problem but they must also see themselves as personally susceptible to any adverse effects from smoking.

Kaufert, Rabkin, Syrotuik, Boyko and Shane (1986) studied the effects of health beliefs on the outcomes of three different smoking cessation treatment modalities: hypnosis, behavior modification and health education. Validity checks of self-report of

the change in the number of cigarettes smoked per day were made via biochemical (blood) analysis. These checks were important to this study since determination of a significant relationship between health beliefs and smoking cessation resulted only when self-report was corroborated by a blood test. Self-report data alone did not result in the same significant findings. For example, of the three different treatment groups, only the health education group showed significant changes in smoking (validated by the blood test) in relation to two health belief scale items: general health concern (r = .58, p<.01) and perceived vulnerability (r = .46, p<.05). The only significant finding for a self-reported measure of smoking cessation was in the hypnosis treatment group for the health belief of likelihood of taking preventive action (r = .39, p<.05). The scale for determining health beliefs related to smoking developed by these researchers is used in this study and is discussed further in the Methodology section.

Kaufert et al. concluded that there is limited evidence of the Health Belief Model's predictive validity for mediating changes in smoking behavior. Only two factors, general health concern and perceived vulnerability (susceptibility) were the major predictors of outcomes in this volunteer-based intervention program. The authors also suggest that pre-existing health beliefs, or attitudes toward health prior to treatment intervention, may influence the level of success achievable with certain modalities of promoting cessation of smoking. For example, those individuals with an initial high level of a general concern for health were associated with less of a decrease in smoking when health education was used as a treatment intervention than with other treatments or with individuals with an initial low level of general health concern. Individuals with initial low levels of perceived susceptibility altered their smoking behavior and exhibited an increase in the level of susceptibility after health education intervention.

The authors concluded that these seemingly contradictory results may be due to the initial levels of each of these belief variables. For example, individuals with low initial levels of susceptibility and general health concern showed a shift to higher levels

upon receiving patient education intervention with a subsequent decrease in smoking. In comparison, those individuals with high initial levels of these variables showed less of a reduction in smoking behavior than their counterparts with lower initial levels. In both instances, a decrease in smoking was achieved but the level of success in achieving this reduction was affected by the initial level of the predictor variable.

Pederson, Wanklin and Baskerville (1984) found significant relationships between certain health beliefs and compliance with quitting smoking in a pulmonary (chronic obstructive pulmonary disease or COPD) population: (a) intensity of physician's message and perceived severity of condition, (b) association with primary diagnosis, perceived severity and causal relationship to smoking, and (c) duration of smoking habit and perceived severity, probability (causal relationship), and efficacy of quitting. They concluded that, for general attitude, health beliefs about smoking were not indicative of preventive health behavior in general. These researchers advise that, from the results of their study, health beliefs should be considered when advising patients to quit smoking although these attitudes do not function in complete isolation in determining health-related behavior. Further, compliance with advice may depend on the interaction between health beliefs and other variables such as reason for smoking.

Cluss and Epstein (1985) contend that the most important use of the Health Belief Model may not be to predict compliance but to develop a better understanding of why people do or do not comply. Ultimately, by translating global noncompliance factors into more specific and operational terms, individualized behavioral treatments can be developed to alter specific mechanisms of compliance based on individual differences.

THE VALUE OF HEALTH

As suggested by Rotter (1975), a measure of reinforcement value should be used in conjunction with locus of control measurement and situation-specific measures are necessary for better prediction of behavior. According to Wallston and Wallston

(1981), the use of health locus of control to predict behavior requires a measure of health value for better interpretation of results. They pose the question: Why should believing one can control their own health be associated with actions to maintain good health if health is not valued? The salience of health value (HV) differs within the context of the health state, i.e., health value in a life-threatening situation would be greater than in an illness prevention situation (Wallston, Maides & Wallston, 1976). Application of health value in accordance with the Health Belief Model corresponds to the variables of interest and concern about health.

As a result of a review of the literature on locus of control and health-related issues, Strickland (1978) believes that internals who value their health will seek more information about health maintenance and will learn more about disease when stricken than externals. Health behavior should be carried out by people who value their health highly (i.e., think good health is very important) and expect their behavior to enhance their health. In other words, according to Wallston and Wallston (1984), internal versus external health locus of control beliefs would be endorsed such that HB = f(HLC x HV), or health behavior (HB) is a function of health locus of control (HLC) and health value (HV).

Studies have shown that, in general, health locus of control beliefs correlated with relevant health behaviors only among those who value health highly such that high HV-internal locus of control subjects perform more health-related behaviors than do externals or low HV subjects (Lau, 1982; Lewis et al., 1978; Nagy & Wolfe, 1984; Wallston, Maides & Wallston, 1976; Wallston, Wallston, Kaplan & Maides, 1976). Relative to smoking behaviors, Kaplan and Cowles (1978) found that smoking reduction was maintained longest by internal-high HV subjects. Low HV internals began smoking again after treatment. Kristiansen (1985) found that heavier smokers engaged in less preventive behaviors than lighter smokers who reported valuing their health more than heavier smokers.

Lau, Hartman and Ware (1986) developed a Health Value Scale which, in the initial scaling study, was strongly associated with the belief that illness is a serious but controllable problem, positively related to the self (internal) and provider (powerful others) health locus of control subscales. The scale was weakly associated with a factor for poor health status and almost completely unrelated to satisfaction with doctors and the medical care system, beliefs that the world is controllable, and beliefs about a general environmental threat to health.

In a second study with college students, Lau, Hartman and Ware used the Health Value Scale to test if health value moderates the link between (a) health locus of control beliefs and health behavior and (b) components of the Health Belief Model and preventive health practices. The complete questionnaire included items from a health locus of control scale by Lau and Ware in addition to measures of beliefs in the benefits and barriers to performing preventive behaviors (e.g., exercising, not smoking, etc.). Of the three HBM components, only efficacy beliefs (defined as benefits minus barriers according to Lau et al.) were consistently associated with the dependent variable of preventive behaviors in previous work. This study did not measure seriousness or susceptibility beliefs. The "efficacy" scores were highly correlated with preventive health behaviors for those with high value for health. Thus, efficacy beliefs predict performance of an associated preventive health behavior more strongly among those with high health value than those with low health value.

When disease or symptoms are very life-threatening, Lau, Hartman and Ware believe that the value placed on health will be uniformly high and, therefore, of little use to researchers. Following this reasoning, HV measures are not critical to this study due to the life-threatening nature of cardiopulmonary disease. It is, however, included in this study in order to test Lau, Hartman and Ware's assumption. In addition, one smoking cessation study utilized the MHLC scale, determining that internals are more

abstinent after 6 months than subjects in the chance and powerful others categories (Shipley, 1981). However, since Shipley's study did not utilize a HV measure to support his findings, as suggested by the authors of the MHLC, there is valid reason to include the HV variable in this study. A discussion of the reliability measures of the Health Value Scale is found in the Methodology section.

SELF-REGULATION

Self-regulation, or self-initiated and self-directed activity, is defined by Rodin (1982) as that which implies the ability to produce and/or maintain a given behavior or any state in general, especially when there is a perceived discrepancy between actual and optimal states. The biopsychosocial model of self-regulation must consider motivation and/or goal setting, specific responses (such as learned or reflexive skills), cues to elicit motivation and responses, reinforcement, and feedback (Rodin, 1982).

Control over one's own behavior is not an act of willpower but of self-regulatory capabilities requiring tools of personal agency, such as stimulus and situation control, and the self-assurance to use them effectively (Bandura, 1982; Thoresen & Mahoney, 1974). The conditions central to self-regulation are motivation, behavioral standards, representations, prior experience, and monitoring, evaluation, and reinforcement of self actions (Carver & Scheier, 1981; Kanfer & Karoly, 1972; Thoresen & Mahoney, 1974).

Self-regulatory behaviors generally result in some modification of one's own behavior or of the environmental setting. Sequentially, self-monitoring, self-evaluation against some performance standard, and self-reinforcement are the formal components of self-regulation. Self-control is viewed as a special case of self-regulation, one in which a highly probable behavior is not executed. The major difference between these two is the performance standard employed in self-regulation

versus the performance contract or promise used in self-control (Kanfer & Karoly, 1972).

The construct of self-regulation depends on good theory to indicate which techniques to develop, for whom they should work and in what situations, and because they allow us to know how and why things work (Rodin, 1982). Citing support in the work of Kanfer and Karoly (1972) on the three-stage process of behavior (self-monitoring, self-evaluation and self-reinforcement), Heckhausen and Weiner (1974) state:

> Within such a self-regulative process, statements of intent are necessary precursors for the initiation of new behaviors which may come to dominate initially stronger responses in the person's habit-family hierarchy. The new behaviors are instigated by 'performance promises' or 'contracts' made with oneself, often in communication with another person, such as a therapist (p. 64).

According to Kanfer and Karoly (1972), these intentions alter the self-reinforcing consequences of action by changing the performance standards which provide a basis for self-evaluation.

Heckhausen and Weiner posit a process model of self-regulation involving four temporally sequential stages: the foreperiod, the performance period, the immediate post-performance or self-evaluation period, and the delayed post-performance period. The foreperiod involves diverse cognitive activity regarding the imminent performance (e.g., appraisal of the situation, plan of action, intentions, determining the standard for performance evaluation, prospective causal attributions, expectations for success or failure, relevant performance information, etc.).

Continuous self-monitoring of behavior usually occurs during the performance period. Comparison to a performance standard occurs during the self-evaluation (immediate post-performance) period where the standard may be deduced from

generalized expectancies of the motive system, or those set by an intention made during the foreperiod. General standards are more resistant to reappraisal and change than specific intentions. In the final, delayed post-performance period, reappraisal of the components of the first period usually occurs including altering causal ascriptions, intentions or standards, planning and expectations.

Internal and external cues for self-regulation are useful in relation to the perceived discrepancy between optimal and current state. Internal cues include internal standards, affect, verbal commands, and physiological signals. Reliance on internal cues requires techniques for monitoring and evaluating these internal events. External cues could be sociocultural processes (e.g., norms and value systems) or elements in one's own environment that signal a discrepancy from one's goals (Rodin, 1982).

Self-regulation strategies have been demonstrated in various contexts. Zimmerman and Martinez-Pons (1986) assessed self-regulation learning strategies during class, homework and study contexts, using a structured interview procedure, and their relationship to achievement in school. They found the high achievers to use more of these self-regulation strategies than the low achievement group for 13 out of 14 strategies presented. In addition, 93% of the students could be correctly classified into their appropriate achievement group via knowledge of their self-regulation practices.

Proper self-regulation, with regard to illness behavior, includes the monitoring of relevant symptoms, taking action to reduce the symptoms and return to a "health" status (Carver & Scheier, 1981). How people come to identify and label their internal physiological states is a crucial theoretical concern for self-regulation (Rodin, 1982).

People recognize and categorize aspects of themselves and various behavioral contexts they find themselves in, some of which are used as standards for subsequent behavior. Self-directed attention matches against the standards, resulting in adjusting ongoing behavior to approximate the standards. The assumption here is that the self-aware individual is capable of adjusting his or her behavior in the direction of the

standard. However, interfering factors become problematic in that they disrupt this process. Carver and Scheier (1981) use an example from the behavioral medicine literature to illustrate this point: monitoring the wrong or an irrelevant symptom leads to selecting an inappropriate standard, as in the presence or absence of symptoms in hypertensive patients who then adjust compliance with treatment accordingly (Leventhal, Meyer & Nerenz, 1980).

Synonymous with self-regulation, self-management is defined by Kanfer and Karoly (1982) as the tendency to maintain or alter the course of one's goal-directed behavior independent of discernible external influence. They see self-regulation as the central concept in self-management, considering self-regulation as "the integrated organization of a series of component processes that serve to achieve the person's objectives" (p. 577). Thus, self-regulation denotes the psychological processes by which an organism mediates its own functioning via goal-directed behavior and the development of a hierarchy of values for decision-making.

Assessment of self-management or self-regulation may require (a) measurement of motives and expectations, as in health locus of control, (b) measurement of performance standards, as in self-help behaviors or activity levels, and (c) measurement of the supportive repertoire, e.g., symptom monitoring, anxiety management, etc. The control model of behavior predicts that the skilled self-regulator does whatever is considered necessary behaviorally to bring about the desired situation or perception (Karoly, 1985).

In this study, the use of self-regulatory processes are investigated to determine if they contribute to compliance with smoking cessation. It is hypothesized that the subject's health locus of control, value, beliefs and use of self-regulatory behaviors will predict the success of smoking cessation or reduction.

Compliance and Self-Regulation

The medical model of compliance defines the medical goal and prescribes medical action considering the patient's viewpoint as irrelevant. This model takes an external or observer frame of reference regarding patient behavior. The self-regulation model, on the other hand, requires the patient's representation of the problem be defined, i.e., how the patient views the nature of the illness, its cause, consequences and duration, and appropriate steps for intervention. This latter model takes an internal or actor frame of reference regarding patient behavior (Leventhal, Zimmerman & Gutmann, 1984). The medical model disregards the patient's beliefs concerning symptoms, as in the presence of disease, and ability for coping. In contrast, the self-regulation model is concerned with the individual's projection of goals for his or her own behavior, e.g., will treatment eliminate symptoms, duration of treatment to effect change, and evaluation of treatment which fails to meet their criteria (Leventhal et al., 1984).

According to Leventhal, Zimmerman and Gutmann, the primary focus in the self-regulation model is the process of change and stabilization, not adherence to a prescribed regimen. Compliance refers to the interaction between the patient's self-selected pattern of regulatory behaviors and the prescribed therapy, and is an evaluative concept. Therefore, the pattern of behaviors is the standard for self-regulation, given the individual's representation of the problem, coping skills and appraisal of outcomes. Leventhal, Zimmerman and Gutmann enumerate four components in self-regulation for risk reduction: (1) representation of the risk as developed by the individual, (2) acquisition of self-regulatory skills for behavioral change and maintenance, (3) appraisal of outcomes and the attribution of change to one's own efforts in generating effective responses, and (4) integration of new habits into a personal lifestyle. The third component relates to locus of control and health belief characteristics, the fourth relates to maintaining compliance.

While Kanfer and Karoly (1982) noted the factors of goal-directed behavior and hierarchy of values for decision-making as integral components of self-regulation, Leventhal, Zimmerman and Gutmann cite the following two factors as key components in self-regulation theory: elements underlying the regulation of behavior, and concern for the match between the factors regulating behavior and the individual's perception of these factors.

In relation to medication or therapeutic regimens, self-regulated behavior will be affected by the extent to which the behavior or treatment is seen as reducing the severity of the symptoms. Adherence to a prescribed regimen will depend on the overlap between compliance and the self-generated course of action resulting from self-analysis processes. From their work on self-regulation, Leventhal, Meyer and Nerenz (1980) concluded that long-term compliance with protective recommendations (e.g., cessation of smoking) seems to require exposure to information about the danger and about a specific plan for action. In the self-regulation model of drug-taking behavior, for example, symptoms act as cues and the removal of symptoms as feedback. The most important cues are those which are available, experienced directly, and which imply instant and continuous feedback about the progress of illness (Rodin, 1982).

The self-regulation model suggests an important need for assessment of the link between compliance and the actor's goals, attitudes, and self-concepts. If the actors link compliance to their attitudes and self-concepts, they are likely to make a variety of attributions about their ability to generate healthy behaviors and their interest in generating such behaviors. In turn, this builds a coherent behavioral regulatory system and insures long-term involvement in health actions. According to Leventhal, Zimmerman and Gutmann, few studies have been directed towards this goal. They believe that the self-regulation approach offers the most comprehensive theoretical framework for research in behavioral medicine.

Linn, Skyler, Linn, Edelstein and Sandifer (1985) investigated the role of self-management techniques in controlling diabetes. Stress is a factor known to adversely affect the diabetic's metabolic control of the disease. Since diabetic patients must involve self-monitoring, self-evaluation and self-control in controlling their disease (e.g., following prescribed diets, medication regimens, foot care, exercise, and monitoring urine or blood glucose levels), these researchers chose to look at the coping strategies used by diabetics in controlling stress. They found that the more the individual used self-control methods of coping with stress, the better the control of diabetes.

Linn et al. postulated that adhering to a complex medical regimen over a long period of time in a chronic disease, as in diabetes, requires major effort and a high degree of self-efficacy. They found the correlation of self-control coping with patient compliance to be high such that self-control strategies used were related to self-management styles of coping with stress (e.g., denial of pleasure, postponement of enjoyment until a later time, etc). Accordingly, these researchers concluded that such self-denial requires inner strength and belief in the ability to exercise control over the environment and one's own emotions. Thus, diabetics who have difficulty in maintaining diabetic control should be considered for self-management type programs which include achievable short-term goals which provide the behavioral standards and feedback necessary for successful goal attainment, motivation and control.

A study of asthma patients' ability to self-manage their disease symptoms showed that these patients were poorly informed about their medications, that social support was important in the management of the condition, that a primary goal for these patients is to reduce the stress associated with panic reactions to asthma attacks, and that it is important to promote an increase in self-efficacy in self-management programs (Bailey et al., 1987). The investigators based their study on several theories, two of which are relevant to this research: social learning theory and the Health Belief Model. As a result

of significant negative correlations between self-efficacy and management of asthma and compliance, these investigators concluded that if the patient cannot recognize signs of an impending attack or feel in control of his or her condition, compliance with an inhaler medication would decrease.

In the self-regulation perspective, patients are viewed as active agents, choosing their own goals which are determined by their perceptions or representation of their illness and treatment setting, selection of responses to reach these goals, and their evaluation of their progress in goal attainment (Schulman, 1979). Compliance with treatment, relative to self-regulation theory, falls within the framework of illness representations.

Prior experience and individual meaning are important factors to consider in compliance. When a patient takes in information, it is assimilated to pre-existing meaning and action structures so that the patient assembles his or her own representation of the particular illness problems and plans for action. Patients represent or define illness on either a concrete level of symptom experience or an abstract level of disease labels, relative to prior experience, meaning and self-monitoring of symptoms. According to Leventhal, Meyer and Nerenz, cognitive skills utilized in self-regulation (such as positive self-esteem, imagination, goal setting and anticipation of potential outcomes) appear to underlie both generation of the illness representation and creation of the plan for action. The patient's representation of illness provides a focus for self-regulating behaviors that may expand into a greater sense of self-determination and control over both emotional experiences and the quality of life.

Representations of illness also include beliefs about the cause of the illness, expectations about its duration (e.g., acute, chronic, cyclic), and beliefs about the consequences and susceptibility to treatment. Beliefs are often implicit (versus explicit), difficult to represent verbally, function as an organized system helping the

patient to explain and interpret his or her experience, and are resistant to change. These attributions affect treatment and compliance and may even result in patients hiding the reason for noncompliance in order to avoid confrontation between their private, implicit theories of illness (e.g., symptoms, causes and cures) and the practitioner's medical model (Leventhal et al., 1980; Leventhal et al., 1984).

Self-Regulation and Smoking

Kanfer and Stevenson (1985) contend that activities occurring concurrently with self-regulation may determine therapeutic success, for example, as in the control of smoking. If the individual engages in activity that competes with the cognitive requirements for self-regulation, interference with the success of the self-regulatory activities may occur. Also, if the cognitive contexts are too complex, success will be limited. For example, patients may report that they are able to control smoking easily during leisure activities but not in their working environment.

Turk and Kerns (1985) believe that self-observation techniques which permit the identification and examination of internal events are the hallmark of cognitive-behavioral assessment. In addition, self-monitoring strategies increase the individual's perception of the sense of involvement as an active agent in his or her own health care. Self-monitoring usually involves recording specific aspects of overt and covert behaviors, i.e., thoughts, feelings and images that precede, accompany and follow target behavior. It may also be useful in identifying controlling variables and as a treatment technique to bring about behavioral change (e.g., assisting the patient in perceiving control of maladaptive behaviors).

In the case of cigarette smoking, the individual may be asked to monitor thoughts and feelings at the time of an urge to smoke, the salient environmental cues associated with the urge, whether he or she smoked the cigarette, how he or she felt and how others responded. Such monitoring may influence or be influenced by symptoms or may lead

the patient to identify environmental events that instigate risk-related behavior or smoking relapse. Including the responses of others to the subject's behavior may identify environmental influences in the maintenance of symptomatic behaviors. Thus, monitoring, as an assessment tool, may facilitate the conceptualization of the problem at hand as being explicable and controllable in relation to specific thoughts, feelings, behaviors and socioenvironmental characteristics (Turk & Kerns, 1985).

In a descriptive study of long-term smokers who used self-directed techniques rather than professional help to quit smoking, Baer, Foreyt and Wright (1977) found 15 different categories of techniques used by 51 respondents to their survey. The study did not yield any significant findings, but of all the techniques described, motivation to quit was reported most often by 46% of the subjects. The investigators concluded that the subjects emphasized motivation in instituting termination of smoking on a self-control basis. They contend that, left to themselves, individuals interested in smoking cessation by self-control often generate methods appropriate to themselves. Thus, matching treatment procedures to the individual's needs or to such personality characteristics as locus of control may enhance the effects of smoking control programs.

Prochaska and DiClemente (1983) developed a transtheoretical model involving 10 processes of change over five stages of change. With regard to smoking cessation, these five stages of change describe the subject groups: long-term quitters (or those in a maintenance stage), recent quitters (or those in an action stage), contemplators, immotives (or those in a pre-contemplation stage), and relapsers. The 10 processes of change include: consciousness raising, self-liberation, social liberation, self-reevaluation, environmental reevaluation, counterconditioning, stimulus control, reinforcement management, dramatic relief, and helping relationships. These investigators found that there were significant differences in how frequently each of the groups used the 10 processes. The immotive subjects, or those in the pre-contemplation stage, used the fewest change processes. Consciousness raising was used

most during the contemplation stage whereas self-reevaluation was emphasized in both the contemplation and action (or recent quitters) stage. Self-liberation, a helping relationship and reinforcement management were emphasized during the action stage only. Lastly, counterconditioning and stimulus control were mostly used during the action and maintenance (or long-term quitter) stages.

In a study of light versus heavy smokers, Rossi, Prochaska and DiClemente (1987) found that the light smokers (those who smoked less than 15 cigarettes a day) utilized the processes of change cited above more frequently than did the heavy smokers (or those who smoked more than 30 cigarettes a day). Significant differences between light and heavy smokers were demonstrated on five of the 10 processes of change variables: counterconditioning, environmental reevaluation, reinforcement management, self-liberation, and stimulus control. These results parallel Prochaska and DiClemente's (1983) study in which some of these same processes, namely self-reevaluation and reinforcement management, were more frequently used and are synonymous with the self-regulatory behaviors of self-monitoring, self-evaluation and self-reinforcement.

Rossi, Prochaska and DiClemente found the light smokers to be more successful in their attempt to quit than the heavy smokers, which is consistent with smoking cessation research results, and which they attribute to the use of more self-change strategies among light smokers. In addition, they posit an interesting note concerning smoking behavior and research: the current trend is to find a decrease in light smokers and an increase in heavy smokers which influences the ultimate outcome of smoking cessation. If it is easier for light smokers to quit, they may have already done so. As a result, further reductions in the number of smokers will be more difficult to accomplish since those remaining are heavy smokers who typically have more difficulty in quitting.

Lehr and Schefft (1987) compared cognitive-behavioral therapy to self-management therapy in a rehabilitation program for cardiac patients. Compliance with smoking cessation was one of the variables studied. No significant difference was found between groups in terms of treatment completion and general improvement in physiological functioning. The self-management group demonstrated superior improvement on only three of the 14 variables measured. When describing the subjects in terms of locus of control, Lehr and Schefft found the self-management group to attribute less control to powerful others than the cognitive-behavioral group. However, the self-management group also showed a decrease in attribution to internal control, which was an unexpected finding.

These investigators found no difference between the groups on self-report of the compliance measures (smoking cessation, medication, exercise and diet). However, both groups revealed an increase in smoking cessation compliance at the post-treatment assessment which subsequently decreased at the six month follow-up. The reverse of this compliance effect was true for medications: a decrease in compliance with medications was found at post-treatment with an increase at the six month follow-up. Lehr and Schefft attribute their findings to greater effort due to application of the therapy treatment program to their subjects' daily lives. They suggest that the inclusion of a self-management context within a cognitive-behavioral program may improve the health status of cardiac rehabilitation patients.

Schmitz, Garcia and Doerfler (1987) studied the use of self-monitoring procedures to identify problem situations and strategies used to cope with these situations during a four week period following smoking cessation in a group of college students. Thirty-six subjects were asked to record self-monitoring data on a daily basis which included: information about high-risk situations, coping methods used in these situations, number of cigarettes smoked, and self-efficacy in coping with future situations. High-risk situations were either intrapersonal or interpersonal. Coping

responses were either behavioral or cognitive. Weekly telephone interviews with subjects and random corroboration of self-reports of smoking from significant others were also conducted. The telephone interviews were more structured and detailed than the self-monitoring data reported. The corroboration of self-report simply consisted of agreement or disagreement with the subject's information about whether he or she was still smoking or not and did not assess the quantity of cigarettes smoked since the corroborators were not with the subjects at all times for such assessment.

These investigators found that high-risk interpersonal events, especially those involving conflict, were frequently associated with the temptation to smoke. However, intrapersonal events, such as negative emotional situations, occurred more frequently than interpersonal situations. Subjects engaged in eating/drinking and distracting activities as the most common behavioral responses while distraction and thinking about positive health consequences of cessation were the most frequently used cognitive coping responses. In general, behavioral coping responses were used more frequently than either cognitive coping or no coping and subjects were found to have smoked fewer cigarettes when they used behavioral versus cognitive strategies.

For this study, relapse was defined as smoking more than 33% of the pre-study rate whereas a slip was defined as smoking less than 33% of the pre-study rate. Schmitz, Garcia and Doerfler found that these smokers generally had not relapsed (i.e., smoking more than 33% of the total number of cigarettes smoked before entering the study) but were smoking a very small number of cigarettes while struggling to remain abstinent. They concluded that the high rate of slips and relapse crises associated with interpersonal events indicate that these factors are important to cessation compliance even if they are relatively uncommon or overlooked by smokers.

SMOKING AND CARDIOPULMONARY DISEASE

Smoking has been directly linked to cardiovascular disease, lung cancer, and chronic obstructive lung disease (COLD), and other illnesses as outlined in the Surgeon General's Report on smoking and health (Public Health Service, 1979). Smoking is considered the first of three major independent risk factors for coronary heart disease (CHD), the others being hypertension and hypercholesterolemia, and acts synergistically with these to greatly increase the risk of CHD (Public Health Service, 1983). Smoking has also been found to contribute to exacerbation of the following cardiovascular diseases: arteriosclerosis, peripheral vascular disease, and cerebrovascular disease. Cigarette smokers are twice as likely as nonsmokers to develop CHD; heavy smokers (those smoking 20 cigarettes a day or more) have a four-fold incidence of CHD as compared to nonsmokers. Smokers experience a 70% greater CHD death rate than do nonsmokers; heavy smokers have a death rate two to three times greater due to CHD than nonsmokers (Public Health Service, 1983).

According to the Surgeon General's Report (1979), smoking is considered a major independent risk factor for the development of fatal and nonfatal myocardial infarction (MI) in both males and females. Further smoking is a risk factor in second heart attacks among survivors of MI and diminishes survival after heart attack among those who continue to smoke. Cessation of cigarette smoking can reduce the risk of mortality from CHD and allow the individual to attain a risk status similar to a nonsmoker if cessation is maintained. Of primary importance to this study is the known effect smoking has on CHD patients, placing them at high risk of exacerbation or recurrence of their condition.

Smoking is also implicated as the chief contributor to excess mortality rates for both men and women in non-neoplastic bronchopulmonary disease (chronic obstructive pulmonary or lung disease, COPD or COLD) including chronic bronchitis and emphysema. These disease processes result from chronic cough and phlegm production, airway

thickening and narrowing, and structural changes in the lungs which are smoking induced. According to one Surgeon General's Report, smoking is the only major predictor for developing or dying of COLD; 80-90% of COLD in the U.S. is attributable to smoking (Public Health Service, 1984). Smokers have a higher prevalence of abnormal lung function than nonsmokers which is greater in heavy smokers than in light smokers. Cough, sputum production and severity of emphysema is dose-related, i.e., prevalence increases with an increase in the number of cigarettes smoked per day. Cessation of smoking leads to a decreased risk of mortality from COLD but does not decline sufficiently to equal that of never smokers even after 20 years of cessation. Thus, smoking maintains residual effects on lung function long after cessation has occurred whereas risk of mortality from CHD reduces to that of a nonsmoker if cessation is maintained.

The Framingham Study, a longitudinal project spanning 24 years (1950-1974) with some aspects still in progress, is an investigation of factors associated with the incidence of CHD in over 4,000 males in the Albany, NY and Framingham, MA areas. In the study, morbidity and mortality data from persons with CHD were directly correlated to their smoking habits. A three-fold increase in MI was found for persons smoking cigarettes, especially among those smoking more than 20 cigarettes a day, as compared to nonsmokers or former smokers (Doyle, Dawber, Kannel, Heslin & Kahn, 1962). Cessation of smoking was found to reduce the risk of CHD (Doyle, Dawber, Kannel, Kinch & Kahn, 1964). The findings have also shown that nicotine and carbon monoxide are hazardous to the heart, especially one already placed in jeopardy by pre-existing disease (Dawber, 1980).

Rosenberg, Palmer and Shapiro (1990) found that, among current women smokers, the risk of a first nonfatal MI increases with the amount smoked and is considerably increased for heavy smokers. A reduction in this risk to a level approximating that of women who have never smoked occurs within 3 to 4 years after

quitting regardless of the amount smoked, duration of smoking, and the presence of other predisposing factors for MI. These researchers concluded that: (1) an increase in the risk of MI attributable to cigarette smoking is largely reversible within a few years, (2) the results of this study parallel that of similar studies with male subjects, and (3) women are less successful at quitting than men, based on a reduction by almost 50% in the proportion of American male smokers between 1964 (51%) and 1986 (29%) versus a reduction in American female smokers by less than one-third during the same period (33% vs. 24%).

According to Pomerleau (1979), social learning theory categorizes smoking as a learned behavior which can be modified using learning and conditioning strategies. However, Pomerleau believes smoking is resistant to modification because it is a maladaptive behavior which is overlearned and under the influence of immediate small reinforcers. Less emphasis is placed on the more aversive and delayed consequences of serious illness or death by the smoker. Davis (1967) contends that compliance requires the individual to give up certain behavior which he or she may not want to relinquish. For example, it is likely that cardiac patients would choose to reform work and diet habits before making the more difficult choice of changing a personal habit such as smoking.

A longitudinal study of mortality and smoking by Doll and Hill (1964) involved a population sample of over 40,000 British physicians studied over a 10 year period. They found the death rate of smokers to be 23% higher than nonsmokers and that there was a statistically significant difference ($p<.01$, statistic not reported) in death rates due to myocardial degeneration between smokers and nonsmokers. A 20 year follow-up of these physicians provided a clearer delineation of the findings (Doll & Peto, 1976). For deaths due to ischemic heart disease (almost one-third of all deaths in the sample), mortality rates were three times as high in men who had ever smoked as compared to never smokers ($p<.05$, statistic not reported). Deaths due to myocardial degeneration in

conjunction with chronic bronchitis or emphysema were classified as deaths due to pulmonary heart disease. Doll and Peto grouped these subjects with those whose deaths were caused by COLD alone (a total of 304) to find only 3 deaths in physicians who had never smoked. These authors concluded that the relative risk for cigarette smokers for COLD as compared to nonsmokers was greater than for lung cancer and that COLD is as important a fatal effect of smoking as lung cancer. The results of this study parallel those found in the Surgeon General's Report (Public Health Service, 1979): smoking caused death chiefly by heart disease, lung cancer, COLD and various vascular diseases.

In a descriptive study, Hay and Turbott (1970) followed 59 coronary insufficiency patients and 370 patients post-MI who were smokers to determine changes in smoking habits. Seventy-four percent of the MI patients were smokers upon hospital admission of which 37% were considered heavy smokers (more than 20 cigarettes per day). A two-year follow-up of 296 MI subjects showed 44% of the sample (all smokers) were still smoking (versus 74% upon admission): 25% of these did show an improvement by reducing the number of cigarettes smoked from the previous level at the time of admission while the number of heavy smokers declined to 6% (versus 37% on admission). From the original sample of MI subjects, 29% quit smoking, 13% of which were originally heavy smokers.

Seventy-five percent of the 59 coronary insufficiency group were smokers but only 27% of these were heavy smokers. At follow-up, 45 patients were interviewed of which only 11% gave up smoking. In comparison, this group was less successful in quitting than the MI group (11% versus 29%). Hay and Turbott suggest that the infarct patient tends to remain in the hospital almost twice as long as the coronary insufficiency patient which, when added to the more severe nature of the MI condition, may contribute to the success rate of cessation. They also suggest that the persistent nature of the anginal symptoms experienced by the coronary insufficiency patient may weaken the patient's desire to quit.

After leaving the hospital, the mortality rate (reported for MI patients only) was 15.5% for nonsmokers and 23.4% for moderate and heavy smokers. They concluded that a significant proportion of MI patients can be persuaded to quit while still in the hospital and remain nonsmokers for at least one year. (No statistical analyses were performed on these data by the authors.) Several other studies have also suggested that individuals who develop MI and give up smoking may revert to a nonsmoker's pattern, lending support to the postdischarge mortality results of Hay and Turbott's study (Dawber, 1980; Doyle et al., 1962; Doyle et al., 1964; Public Health Service, 1979).

In a retrospective study utilizing CHD patients who were smokers, Giannetti, Reynolds and Rihn (1985) sought to determine whether health beliefs and social support for cessation of smoking predicted cessation among cardiovascular disease patients. This study included patients with the following diagnoses: MI, angina pectoris, arrhythmias, congestive heart failure, artherosclerosis, hypertension, and coronary artery disease. Limited support for the Health Belief Model was found, in relation to perceived benefits versus cost of smoking, in addition to confirmed support for the importance of a social support network for discontinuance of smoking. Health locus of control (via a measure by Kirscht, 1972) was not a discriminant factor in differentiating between smokers and ex-smokers.

After retrospectively following MI and coronary artery bypass graft (CABG) surgery patients, Scott and Lamparski (1985) refute the widely held assumption that patients who experience life-threatening cardiac events are more motivated to maintain long-term abstinence from smoking. Upon using a method for verifying self-report (measuring carbon monoxide levels), 33% of the subjects claimed to have quit smoking but only 29% were correctly classified as nonsmokers by the validation test. These researchers concluded that of the 80% of cardiac patients who quit smoking either while still hospitalized or immediately after, most resumed smoking immediately prior to or after discharge or within the first year after the cardiac event. They suggest that those

individuals who fail to quit smoking after the first cardiac event are less likely to quit after a subsequent event, indicating the need for intervention during the first hospitalization. Scott and Lamparski also contend that those patients with little belief that smoking contributed to their cardiac problems may be at risk for relapse.

Patients suffering from an initial episode of or recurrent ischemic heart disease (MI or angina) were studied to determine the factors affecting smoking status (Ockene et al., 1985). One of the measures utilized in this study was the MHLC Scale. These researchers found that ex-smokers were more likely to have increased negative attitudes towards smoking and a higher level of occupation or education. Subjects with recurrent heart disease had higher CHLC scores than those with an initial coronary event, thus placing greater emphasis on the role of chance in their health by denying responsibility for themselves, according to the authors. These same individuals also tended to be less anxious and more depressed than the other group causing the authors to suggest that depression may reflect helplessness in this group, consistent with the greater belief in CHLC. Ockene et al. believe that establishing a profile of the hospitalized smoker has important clinical implications and these individuals should be identified early and provided individualized educational programs to change their attitudes and behaviors.

Castro, Newcomb, McCreary and Baezconde-Garbanati (1989) found that moderate-heavy smokers (versus light smokers, all from a student sample): (1) exhibited negative attitudes toward health, (2) enacted unhealthy behaviors more often, (3) exhibited lower levels of health consciousness, and (4) were more knowledgeable about smoking health hazards. They suggest that cigarette smokers, and particularly heavy smokers, are at greater CHD risk because they smoke and practice a less healthy lifestyle and may be in need of educational interventions to change their behaviors.

These researchers posit that educational interventions could promote beneficial changes on psychological factors (e.g., increase concern over the ill effects of CHD risk

factors) leading to changes in smoking behavior. However, moderate-heavy smokers may not change since they are knowledgeable about health risks of smoking yet possess little intention of changing their behavior.

Havik and Maeland (1988), in determining changes in smoking behavior after MI, used a shortened version of the older Health Locus of Control Scale (HLC; Wallston, Wallston, Kaplan & Maides, 1976) and Health Belief Model (HBM) criteria based on MI severity, perceived health status and understanding of MI, and smoking as a risk factor. No relationship was found between short-term quitting and HLC but a significant relationship was found between long-term quitting and HLC ($p<.01$, statistic not reported). No support was found for the HBM since changes in smoking status were not strongly related to knowledge about risk associated with smoking. Havik and Maeland suggest that changes in smoking behavior after MI is related to cognitive, affective, medical and social factors. Antismoking counseling should not be limited to the health risks associated with smoking but should also include other central medical and psychological aspects of heart disease.

In a review of the literature, Pederson (1982) states that in both pulmonary and cardiac disease states, the presence of serious illness may be an important precursor to compliance, adding credence to the physician's advice and enhancing compliance. In relation to these two disease states, she also notes that the pulmonary and cardiology physician must deal with a more recalcitrant group of patients who smoke since many people have already quit smoking.

Rose and Udechuku (1971) tested the recall and effectiveness of antismoking advice in high-risk hospital patients with cardiopulmonary disease. Of the 93 smokers in this group, only 69% recalled antismoking advice and of these, two-thirds continued to smoke, a success rate of only 34%. Foxman, Sloss, Lohr and Brook (1986) studied antismoking advice in chronic bronchitis patients and found that current smokers had

the worst lung function and highest rate of chronic bronchitis, based on the forced expiratory volume in 1 second (FEV_1) test for lung function. A difference was found in the illness behaviors between males and females in this study: males would see physicians when their condition became worse and were more likely to quit smoking whereas females were likely to see physicians when their condition was less severe and were less likely to comply with advice to quit. Foxman et al. concluded that the different patterns in physician visits between men and women influenced the compliance results.

A study of 134 COPD patients who had a diagnosis of either chronic bronchitis, emphysema, or bronchial asthma, showed 85% of the subjects were smokers at the onset of the study but at the 6 month follow-up, only 32% did not change their smoking habits (Baker, et al., 1970). All smokers were advised to quit. Of these, 34% did quit and 34% decreased their smoking by one-half or more. Severe disease was defined in this sample as those patients with a FEV_1 of <1.5 L. These individuals often have a 5 year survival rate of approximately 50%. Baker et al. concluded that there was an improvement of symptoms without improvement in pulmonary function and that the factor most closely related to this improvement is the change in smoking habits of the subjects. The authors suggest that changes in pulmonary function are not reversible even at the mild-moderate phase of COPD.

SUMMARY AND HYPOTHESES

From an interpersonal perspective with regard to illness, experience and behavior reflect an interaction between environmental events and a knowledge base which consists of cognitive and emotional memory schemata (Leventhal & Nerenz, 1985). As a result, people should be considered as active agents, rather than as passive responders, as their behavior is influenced by their perceptions and interpretations of situational factors.

The multidimensional nature of compliance, or adherence to a prescribed treatment plan, makes this construct difficult to predict. In this study, several theoretical constructs are presented and discussed in relation to compliance: locus of control, values, beliefs and self-regulatory behaviors related to health. Health locus of control is a measure of one's beliefs about assuming responsibility for health, for example (utilizing the dimensions from the Multidimensional Health Locus of Control Scale, MHLC), outcomes believed to be under one's control (internal health locus of control, IHLC), dependent on others (powerful others external health locus of control, PHLC), or due to chance (chance external health locus of control, CHLC). The health locus of control construct has been used successfully to show that internals do better than externals in smoking reduction (Horwitz et al., 1985; Kaplan & Cowles, 1978; Shipley, 1981), in compliance with medication regimens (Lewis et al., 1978), that chance externals are more likely to suffer recurrent cardiac events (Ockene et al., 1985) or suffer from chronic illness (Wallston & Wallston, 1981).

Health beliefs, based on the Health Belief Model, concern such patient perceptions as susceptibility to and severity of disease (or readiness), and benefits and costs of taking action. Health beliefs have been used to determine behavior modification when smoking is seen as a health threat (Weinberger et al., 1981; West et al., 1977), effects of health beliefs on different types of cessation intervention (Kaufert et al., 1986), and with smoking cessation compliance in general (Pederson et al., 1984). The value a person places on his or her health relates to health beliefs, interest and concern about health. Health value has been successfully shown to affect smoking behavior (Kaplan & Cowles, 1978; Kristiansen, 1985) and preventive health behaviors in general (Lau et al., 1986). The importance of self-regulation to compliance research has been demonstrated in the literature in relation to goal-setting, self-monitoring and various techniques used to achieve smoking cessation (Baer et al., 1977; Lehr & Schefft, 1987;

Prochaska & DiClemente, 1983; Rossi et al., 1987; Schmitz et al., 1987; Turk & Kerns, 1985).

Studies have been presented which discuss patients with chronic pulmonary disease in conjunction with smoking cessation or variables pertaining to this study: health beliefs and self-regulation in asthmatics (Bailey et al., 1987), smoking cessation and health beliefs in COPD patients (Pederson et al., 1984), locus of control and TB patients (Seeman & Evans, 1962), smoking cessation in various COPD patients (Baker et al., 1970) and in chronic bronchitis patients (Foxman et al., 1984).

Research citing variables relative to this study or smoking cessation in CVD include: self-regulation in CVD patients (Lehr & Schefft, 1987), smoking cessation in CVD (Giannetti et al., 1985; Ockene et al., 1985; Scott & Lamparski, 1985), and mortality studies (Doll & Hill, 1964; Hay & Turbott, 1970). Other research investigated mortality rates involving smoking in cardiopulmonary disease (Doll & Peto, 1976; Rose & Udechuku, 1971) and the effect of health locus of control and beliefs in chronic disease (Nagy & Wolfe, 1984).

Wallston and Wallston (1981), in their extensive review of the literature, have documented the necessity of utilizing the health locus of control, health belief and health value variables all together to better predict health behaviors (Rosenstock, 1966; Rotter, 1954; Shipley, 1981; Wallston, Maides & Wallston, 1976). Together, the three variables should be better able to demonstrate a relationship to smoking reduction than if used individually to predict compliance behavior. In addition, the health belief measure incorporates the concept of readiness which is deemed important to successful compliance by illustrating the psychological readiness of the individual to take action (Lau et al., 1986; Rosenstock, 1966).

Nagy and Wolfe (1984) originally incorporated the use of the three variables as predictors of medication and self-management compliance in chronic disease patients in their research design. However, since good health was strongly endorsed on the health

value measure by 90% of the subjects, they decided to eliminate health value as a predictor variable in the analysis of the results. None of the literature reviewed has included all three variables together in a predictor model for compliance. As a result, the proposed model provides the integration of these theoretical bases to be tested in a specific situation in relation to motivation to sustain life as a result of compliance. If successful, the results should show a pattern in the relationship among these variables, indicating a positive correlation between the variables and compliance which may be useful in future research and application in the medical field.

The health locus of control, health belief and health value constructs and the use of self-regulatory behaviors are investigated as to the role they play in compliance, alone or in interaction with each other. A model incorporating the patient's frame of reference is proposed to determine if a relationship exists between these variables and compliance (see Figure 3). A premise for this study is that compliance with a treatment regimen incorporating a change in smoking behavior in chronic disease patients is essential for better health or preservation of life. In this investigation, a test of a compliance model developed to predict success in smoking reduction via an individual's health locus of control, health beliefs, value of health and self-regulation efforts is performed.

Smokers who suffer from a serious illness, especially if it involves the cardiopulmonary system, are usually told to abstain from smoking in order to reduce the risk of suffering further complications and the probability of fatality. Based on the proposed model, individuals measuring higher on the internal health locus of control scale (IHLC) than on the chance (CHLC) or powerful others (PHLC) scales, high on the health belief scale, high on the health value scale, and who use self-regulatory behaviors would be expected to comply with instructions to reduce or quit smoking. The same would be expected of those who emphasize control due to powerful others (i.e., score high on the PHLC) since the physicians, health professionals and/or significant others

interacting with the patient should positively influence the patient to comply. Conversely, those believing in chance personal control (CHLC), those scoring low on the health value and health belief scales and who do not use self-regulation behaviors would not be expected to comply with instructions to modify smoking behavior.

The relationship between the underlying variables are investigated in terms of compliance with instructions to modify smoking behavior by chronic disease patients. Ultimately, if successful, the proposed model would provide the basis for future research in developing patient education for patients described by these variables in order to enhance compliance and health.

Based on the theoretical framework presented, six hypotheses have been formulated to analyze main effects. The first two hypotheses address the control variables in the model:

1. The smoking history (number of cigarettes per day) of the individual will account for a significant amount of the variation in smoking reduction over and above the health locus of control, health value and health belief variables.
2. The frequency of self-regulatory behaviors used by the individual will account for a significant amount of the variation in smoking reduction over and above the health locus of control, health value and health belief variables.

Hypotheses 3 to 5 are derived from the work of Wallston and Wallston (1981) who state that a measure of health value should be included with a measure of health locus of control for better predictive ability. This conclusion is based on studies by Kaplan and Cowles (1978) and Wallston, Maides and Wallston (1976) who used a measure of health value with health locus of control versus Shipley (1981) who did not. Shipley used the Multidimensional Health Locus of Control Scale (MHLC), as did Nagy and Wolfe (1984), whereas the other studies used the older internal-external health locus of control scale. Therefore, this research utilizes the current MHLC scale and a measure of health value in a group of at-risk subjects with a chronic disease.

3. It is expected that internal health locus of control (IHLC) accounts for a significant amount of the variation in smoking reduction over and above powerful others and chance health locus of control (PHLC and CHLC, respectively).

4. It is expected that PHLC accounts for a significant amount of the variation in smoking reduction over and above CHLC.

5. Health value (HV) is expected to account for a significant amount of the variation in smoking reduction over and above the effect of each of the health locus of control variables, i.e., over and above IHLC, PHLC, and CHLC.

The next hypothesis is based on the Health Belief Model variable. As stated by Wallston and Wallston (1981), when using health locus of control measures, health value and health beliefs should also be determined. Nagy and Wolfe (1984) combined the use of the MHLC and health belief variables but did not include health value as a predictor of compliance. The following hypothesis incorporates the use of all three constructs:

6. It is expected that health beliefs will contribute significantly to the variation in smoking reduction over and above each of the health locus of control variables (I, P, and CHLC) and health value.

Hypotheses 7 to 17 represent interaction effects expected among the predictor variables. Hypotheses 7 to 9 state the relationship expected between each of the health locus of control variables and health value:

7. High scores on the IHLC scale (than PHLC or CHLC) and the HV scale are expected to account for a significant amount of the variation in smoking reduction over and above high IHLC scores and low HV scores.

8. High scores on the PHLC and HV scales are expected to account for a significant amount of the variation in smoking reduction over and above high PHLC scores and low HV scores.

9. High scores on the CHLC and HV scales are expected to account for a significant amount of the variation in smoking reduction over and above high CHLC scores and low HV scores.

Hypotheses 10 to 12 state the relationship expected between each of the health locus of control variables and health beliefs:

10. High scores on the IHLC and HB scales are expected to account for a significant amount of the variation in smoking reduction over and above high IHLC scores and low HB scores.

11. High scores on the PHLC and HB scales are expected to account for a significant amount of the variation in smoking reduction over and above high PHLC scores and low HB scores.

12. High scores on the CHLC and HB scales are expected to account for a significant amount of the variation in smoking reduction over and above high CHLC scores and low HB scores.

Hypotheses 13 and 14 represent two-way interactions between the health value and health belief variables, and between self-regulatory behaviors and internal health locus of control:

13. High scores on both the health value and health belief measures are expected to account for a significant amount of the variation in smoking reduction over and above either high scores on only one of the measures or low scores on both.

14. High scores on the IHLC scale coupled with frequent use self-regulatory behaviors are expected to account for a significant amount of the variation in smoking reduction over and above high PHLC or CHLC scores or infrequent use self-regulatory behaviors.

Hypotheses 15 to 17 state the relationship expected between each of the health locus of control, health value and health belief variables. They reflect a test of the conclusions made by several researchers that chronically ill patients tend to be powerful others or chance externals, and individuals who succeed in modifying their smoking behavior tend to have a higher degree of internality.

15. High scores on the IHLC, HV and HB scales are expected to account for a significant amount of the variation in smoking reduction over and above high IHLC scores and low HV and HB scores.

16. High scores on the PHLC, HV and HB scales are expected to account for a significant amount of the variation in smoking reduction over and above high PHLC scores and low HV and HB scores.

17. High scores on the CHLC, HV and HB scales are expected to account for a significant amount of the variation in smoking reduction over and above high CHLC scores and low HV and HB scores.

Hypotheses 18 and 19 represent the interaction effects expected between two of the health locus of control variables, health value, health beliefs, and self-regulatory behaviors:

18. High scores in the IHLC, HV and HB measures, and the frequent use of self-regulatory behaviors will significantly contribute to a reduction in smoking in chronically ill subjects.

19. High scores in the PHLC, HV and HB measures, and the frequent use of self-regulatory behaviors will significantly contribute to a reduction in smoking in chronically ill subjects.

In each of the hypotheses presented, the regression coefficient of each of the main effects and multiplicative terms is hypothesized to be significantly different from zero. Due to the wide variety of scores and interpretations possible on the MHLC, HB and HV scales, the hypotheses reflect directionality of the scores rather than specific cut off points for individual measures to facilitate the analyses.

METHODOLOGY

SUBJECTS

Initially, a sample size of approximately 100 subjects was proposed and confirmed by a power analysis (Cohen, 1988). Seventy-one subjects volunteered to participate in this study. Each subject was a smoker affiliated with the cardiovascular or pulmonary service of a major local teaching hospital or cardiac rehabilitation center. All subjects were required to complete a consent form prior to participating in this study and were screened for eligibility with regard to speaking, reading and writing English, based on education level.

Obtaining subjects for this study necessitated the use of more than one institution. After approval by the Human Subjects and Research Committees of the institutions involved, patients were contacted individually to request participation in this study. Initially, patients from the cardiac and pulmonary services of the teaching hospital were screened and contacted. When an insufficient number of subjects was obtained over a significant period of time, a second institution, a cardiac rehabilitation center, was utilized to enlist additional cardiac outpatient subjects. The results of the screening procedures, personal contact and responses are further described below. Table 1 represents the overall outcome of the patient (subject) acquisition procedures.

From approximately 5,000 patient files available, 400 files of current pulmonary patients were considered for further inclusion review; 367 pulmonary patients were contacted. Of these, 37 responded positively and were entered into the study. Eight pulmonary subjects declined follow-up, consequently, only 29 pulmonary patients completed the study.

Thirteen hundred cardiac in-patient charts were screened for eligibility; 138 were considered for inclusion review and of these, 91 patients were contacted either while in the hospital or soon after discharge. Twenty-two patients responded positively

Table 1

Patient Contact and Subject Attrition

	Cardiac	Pulmonary	All
Number of patients contacted	110[a]	367	477
% of all patients contacted	23.06%	76.94%	(100%)
Number of positive responses (inclusion in the study)	34[b]	37	71
% diagnosis patients contacted	30.91%	10.08%	- -
% of all patients contacted	7.13%	7.76%	14.89%
Number refusing follow-up	5	8	13
% of diagnosis group/sample	14.71%	21.62%	- -
% of sample (N = 71)	7.04%	11.27%	18.31%
Number completing the study	29[c]	29	58
% of all patients contacted	6.08%	6.08%	12.16%
% entering sample (N = 71)	40.85%	40.85%	81.69%

[a] 110 = 91 hospital, 19 rehabilitation center patients
[b] 34 = 22 hospital, 12 rehabilitation center patients
[c] 29 = 18 hospital, 11 rehabilitation center patients

and were entered into the study. Eighteen completed the study while 3 refused follow-up and 1 expired.

Through a cardiac rehabilitation center affiliated with another teaching hospital, approximately 100 rehabilitation patient records were reviewed for eligibility; 19 clients were contacted. Of these, 12 responded positively and were entered into the study. One subject refused follow-up and 11 completed the study. In all, 34 coronary patients had entered the study but only 29 completed the study as did 29 pulmonary subjects. (See Table 1.)

Subjects were approached while still in the hospital or by letter if at home. Sixty face-to-face contacts yielded 25 positive responses and signed consent forms, the majority of which were cardiac subjects. The balance of the 477 patients were contacted via a letter of introduction and consent form explaining the research project (see Appendices A and B). A self-addressed stamped envelope was also enclosed with each letter to increase the rate of return. A total of 72 signed consent forms were received, however, only 71 of the potential subjects were actually eligible for inclusion in the study (34 cardiac and 37 pulmonary patients). Thus, 14.89% of the patients contacted agreed to participate and were included in the study. Eleven of the 71 subjects had both cardiac and pulmonary disease but were entered into the study based on the disease being treated at the time of contact.

Several negative written responses received indicated the reason for declining participation in the study. Among these were: failing health, new hospitalization, relocation, or, as indicated by significant others responding for the patient, loss of cognitive functioning or death.

Several individuals called the hospital, clinics or the investigator to authenticate the purpose of the letter and the identity of the researcher. Others called the investigator to ask for more information about the study and to allay fears of confidentiality, among other things. Each patient who called the investigator returned a

signed consent form and participated at least in the first phase of the study. A few patients called their physicians to request permission to be in the study (none declined) while 2 others requested the investigator call their physicians for them. Since physician approval was part of the procedure for eligibility in the study, each of these subjects participated. Only one physician declined patient participation post-MI. However, after discharge from the hospital, the patient refused to participate in the study after the physician granted permission.

Of the remaining individuals (non-responders), each was contacted within 4 weeks from the date of the initial letter either by phone or, if no phone number was available, by another letter. In most cases, second or third contact yielded only minimal responses. On this basis, if patients did not respond positively on their own initially, they were unlikely to either respond positively to a follow-up letter or to change their minds after a follow-up phone call.

As noted in Table 1, of the 71 subjects who volunteered to participate in the study, only 58 (81.69%) completed the study. Thirteen subjects did not complete the follow-up interview for several reasons including: recurrence or exacerbation of illness (6 subjects), no interest in discussing smoking or their health further (4), going through divorce procedures (1), increase in (therapeutic and recreational) drug use (1), and one loss due to patient death. The resulting final sample of subjects contained 29 each coronary and pulmonary patients. This group consisted of 33 males (56.90%) and 25 females (43.10%). Table 2 presents information on the final sample by age, sex, and diagnosis.

The subject sample obtained for this study depicts a subsample of the population and is not a typical sample representative of the population in general. This is demonstrated in the composition of the sample such that, of the 71 subjects entered into the study, all subjects were Caucasian except for 4 individuals: 3 Blacks and 1 Hispanic. Thus, the sample was largely from a White, middle-class socioeconomic background.

Table 2

Subjects by Age, Sex and Diagnosis

	Cardiac (n = 29)	Pulmonary (n = 29)	All (N = 58)
Age (years)			
Age range	36-73	21-67	21-73
Mean age	56.48	51.21	53.85
SD			12.73
Males	19	14	33
% of diagnosis subgroup	65.52%	48.28%	- -
% of gender	57.58%	42.42%	(100%)
% of final sample	32.76%	24.14%	56.90%
Age range for gender (years)			24-70
Mean age for gender (years)			54.09
SD			11.62
Females	10	15	25
% of diagnosis subgroup	34.48%	51.72%	- -
% of gender	40.00%	60.00%	(100%)
% of final sample	17.24%	25.86%	43.10%
Age range for gender (years)			21-73
Mean age for gender (years)			53.52
SD			14.30
Total (%)	29 (50%)	29 (50%)	58 (100%)

Age and Gender

Almost twice as many males as females (19 vs. 10, respectively) made up the cardiac group whereas the pulmonary group was practically evenly divided by sex (14 males, 15 females). The average age of the sample was 53.85 years, ranging from 21 o 73 years of age. The average age of the males and females was almost equal: 54.09 vs. 53.52 years, respectively. The cardiac group was slightly older then the pulmonary group (average age 56.48 vs. 51.21 years, respectively).

Marital Status and Education

The marital status of the sample was as follows: 44 married (75.86%), 4 divorced (6.90%), 6 single (10.34%), and 4 widowed (6.90%). The educational levels of the sample ranged from 6 years of schooling to 18 or more years (graduate/professional degree). Six subjects (10.34%) possessed a graduate/professional degree, 5 (8.62%) were college graduates, 14 (24.14%) had some college education, 23 (39.56%) were high school graduates, 7 (12.07%) completed some high school, and 3 (5.17%) completed less than 9 years of schooling. The average years of education was 13.33 years.

OPERATIONAL DEFINITIONS OF DEPENDENT MEASURES

Smoking reduction is defined as a decrease in the number of cigarettes consumed daily between the time of initial interview (time I) and at follow-up (time II). Smoking cessation is defined in terms of abstinence from smoking and the length of time of such abstinence for defining smoking status at follow-up. Abstinence is considered to be smoking no cigarettes at all. Smoking status as an abstainer required no smoking for the length of the follow-up period. These stringent measures were used to insure no inflation of cessation rates and no reduction in differences between groups of smokers

and ex-smokers, especially if the subjects smoke and abstained only for a short time prior to follow-up.

INSTRUMENTS

The instruments used in this study have been briefly outlined in the literature review: the Multidimensional Health Locus of Control Scale (MHLC), the Health Belief Scale for Smoking, and the Health Value Scale. In addition, a general questionnaire was utilized to obtain demographic and smoking history data as well as self-regulation data. (See Appendices C and D.)

Multidimensional Health Locus of Control (MHLC)

Various measures have been developed to specifically address internal and external health beliefs (Kirscht, 1972; Lau, 1982; Levenson, 1973; Wallston, Wallston & DeVellis, 1978). The initial two-dimensional (I-E) Health Locus of Control (HLC) Scale by Wallston, Wallston, Kaplan and Maides (1976) succeeded in demonstrating discriminant validity of the HLC over Rotter's more generalized I-E Scale (Rotter, 1966). A pool of 34 items with a 6-point Likert-type format were tested via item analysis resulting in a final 11-item scale. The reliability was .72 and concurrent validity was .33 ($p<.01$) with Rotter's I-E Scale.

Based on Levenson's (1973) work which separated locus of control into a three factor construct (internality, powerful others, and chance for externality), Wallston, Wallston and DeVellis (1978) developed the Multidimensional Health Locus of Control (MHLC) Scales which measure three distinct dimensions: Internality (IHLC), Chance Externality (CHLC), and Powerful Others Externality (PHLC). Two equivalent forms (A and B) of this scale have been developed, each containing three, 6-item scales using a 6-point Likert format to facilitate research requiring a repeated measures design. The

authors suggest randomly distributing each form between pretest and posttest for best results.

In the development of the scales, factor analysis produced three dimensions without error. From an original pool of 81 items (25 IHLC, 30 PHLC and 26 CHLC), six pairs of items (based on meaning) were selected after item analysis, for each of the three new subscales. A reading level of the item pool was calculated to be 5th-6th grade though it was developed for an 8th grade reading level. Equivalent forms of the test were constructed by separating the pairs of items into forms A and B.

Each subscale was determined to be statistically independent of the other. In combined form (A and B scale items together), the I and P scales produced a low intercorrelation of .12; the I and C scales resulted in a negative correlation of -.29; and the P and C scales produced a modest intercorrelation of .20. As a result, high multicollinearity does not occur among the three MHLC scales.

The alpha reliability measures for internal consistency are presented below:

Subscale		Number of items	Alpha
IHLC:	Form A	6	.77
	Form B	6	.71
	Forms A & B	12	.86
PHLC:	Form A	6	.67
	Form B	6	.72
	Forms A & B	12	.83
CHLC:	Form A	6	.75
	Form B	6	.69
	Forms A & B	12	.84

Wallston, Wallston and DeVellis created this new version so that, by assessing more than one dimension of health locus of control, the probability of increasing

understanding and prediction of health beliefs can be greater. This new scale is intended for use with adults with an 8th grade reading level and no functional impairments. For the purposes of this study, a modified version of the MHLC was used which consisted of a 7-point Likert scale which conforms with the other instruments in the battery (see Appendix C, questionnaire pages 5-7, questions #1-18 for Form A and Appendix D for Form B of the MHLC).

Another multidimensional health locus of control scale was examined for possible utilization in this study (Lau, 1982) which included four dimensions: self-control over health, provider control over health, chance health outcomes, and general health threat. Its use was not considered due to lower reliability values (.65, .69, .53 and .48, respectively) and little application in research. A Heart Disease Locus of Control Scale has been developed by O'Connell and Price (1985) but is not suitable for subjects with existing CHD and, therefore, is inappropriate for this study.

Health Beliefs

To test health beliefs, Kaufert, Rabkin, Syrotuik, Boyko and Shane (1986) devised a scale to test compliance with health-related goals consisting of an initial pool of 23 items which referenced salient dimensions of the Health Belief Model. These items were tested to develop 4 subscales related to smoking behavior. The final scale contained 12 items with alpha reliability values ranging from .43 to .62.

Kaufert et al. found extremely limited evidence for the Health Belief Model in terms of predictive validity in smoking behavior changes when using individual components of this scale. For this study, the components of the scale were summed to form the health belief variable. As with the MHLC, this scale has been modified to utilize a 7-point Likert scale for the purposes of conformity in this study (see Appendix C, questionnaire pages 8-9, questions #19-30).

Health Value

Lau, Hartman and Ware (1986) developed a 4-item 7-point Likert scale to measure the value placed on health (primarily related to physical health). This scale had an alpha reliability measure of .67 and test-retest reliability measure of .78. A test for validity was performed via factor analysis with other measures including four health locus of control subscales (Lau, 1982). A second scaling trial was performed in five sample populations after rewording the 4th item. The alpha reliability values for internal consistency ranged from .63 to .73 while the test-retest reliability value was .62. This finalized scale is presented in Appendix C (questionnaire pages 10, questions #31-34).

Self-Regulation

Self-regulatory behaviors were recorded by the patient for the day of each interview (time I and II). This self-report also included for each day interviewed self-observation and recording of smoking patterns. Due to the high dropout rate associated with self-monitoring procedures and the difficulty involved in collecting self-regulation data, only the data available when the subjects were initially interviewed and at the follow-up interview were utilized. (Self-regulatory behaviors are shown in Appendix C, questionnaire page 12, question #6.)

Turk and Kerns (1985) have outlined a set of requirements for self-monitoring: it should be easy to implement, reasonably brief and not excessively intrusive with concrete target behaviors. As suggested by these authors, subjects were asked to respond to event sampling and/or time sampling. For example, the subjects were asked to note each time the behavior occurred (e.g., smoked a cigarette) or if the behavior occurred during a specific period of time (e.g., after meals). Researchers caution that subject attrition is high with self-monitoring procedures in smoking research and have

attributed this directly to the recording procedures (Moss, Prue, Lomax & Martin, 1982; Prue, Scott & Denier, 1985). In relation to this limitation, Glasgow (1986) believes that self-monitoring procedures should not be continuously required throughout research or treatment program periods or detrimental (attrition) effects will occur. Prue et al. also note that dropout rates are lower with smokers who are only asked to provide estimates of smoking rates. Therefore, the subjects' reports of self-regulatory behaviors were obtained at the initial and follow-up interviews. Self-evaluation was based on evaluating behavior against the standard of quitting such that the ultimate goal or criterion is abstinence from smoking (see Appendix C, questionnaire pages 11-13).

COMPLIANCE ASSESSMENT

According to Burling, Singleton, Bigelow, Baile and Gottlieb (1984), the methodology used in research studies on smoking cessation after myocardial infarction (MI) fails to control for differences between smokers and ex-smokers and overestimates cessation rates. They suggest corrections for methodological shortcomings which have been incorporated in the methodology for this study: (a) specific definition of abstinence, (b) validation of self-reports, (c) specification of the advice for quitting smoking, and (d) subjective characteristics such as not eliminating certain races or gender.

The operational definitions for smoking reduction and cessation have already been stated. For this study, self-reports were validated by follow-up with a significant other. A biochemical analysis was performed to further validate this data. However, due to technical problems, this analysis was not available throughout the study, as will be explained in the next section.

The use of self-report data should not be challenged as totally unreliable since other assessment methods are not unproblematic, more accurate, or without limitations.

Self-reports can clarify individual idiosyncratic perceptions and stimulate new methods of intervention (Turk & Kerns, 1985). If a goal of research and compliance assessment is to identify a subgroup of a patient sample that is likely to be amenable to improving compliance strategies (as seen with patients who identify themselves as noncompliant and considered to be more likely to respond to interventions) then self-report methods of compliance are adequate (Cluss & Epstein, 1985).

Pechacek, Fox, Murray and Luepker (1984) differentiate between the various methods of measuring smoking and reaffirm the need for validation of self-report data. Biochemical analysis can be performed via several methods: carbon monoxide (CO) levels in blood or expired air, thiocyanate (SCN) levels of either serum or saliva, or plasma cotinine levels. Since the biological half-life of carbon monoxide is short (4-5 hours), it is not a good validation measure. Cotinine levels (a metabolite of nicotine), like CO can be affected by recent exposure to smoke and is expensive. Serum thiocyanate levels are more appropriate because of its longer half-life (10-14 days) and has been repeatedly used as a measure of smoking cessation (Benfari & Eaker, 1984; Kaufert et al., 1986). Saliva levels are 15-20 times higher and more variable than serum levels. However, SCN can also be affected by foods in the diet such as broccoli, brussel sprouts, cabbage, cauliflower, or other varieties of Brassica oleracea, and the tests are expensive. False positive SCN levels resulted in a study where any of these vegetables were consumed or if the individual smoked a nontobacco product, or worked in a smokey environment within one day to one week prior to the evaluation (Swan, Parker, Chesney & Rosenman, 1985). Benfari and Eaker (1984) state that SCN levels >95 µm best differentiate smokers and nonsmokers (where a level of >95µm is used to classify the subjects as a smoker).

Lichtenstein (1982) and Prue, Scott and Denier (1985) note that saliva thiocyanate seems to be the best indicator in terms of sensitivity, reliability and nonintrusiveness. Prochaska and DiClemente (1983) used saliva samples to detect

thiocyanate levels as a method of increasing validity of self-reports of smoking behavior as a result of the "bogus pipeline phenomenon" (Jones & Sigall, 1971): when subjects are aware that smoking status (or any self-reported data) will be validated by physiological/biochemical measures, the accuracy of self-report increases. However, Prochaska and DiClemente concluded that self-reports may be more valid indicators of smoking status than thiocyanate levels. This notion is substantiated by Petitti, Friedman and Kahn (1981).

Petitti et al. investigated the accuracy of self-report data against standard physiologic measures for smoking (SCN and CO). They found the self-administered questionnaires (self-reports) to be an accurate source of information on smoking habits with internally consistent responses which were highly reproducible. The sensitivity of the physiologic tests was low (0.72) due to their limited ability to discriminate nonsmokers from those who smoke 10 or more cigarettes per day. Even though the laboratory measures would seem preferable because they are "objective," Petitti and her colleagues demonstrated that, on two different types of questionnaires, most (98%) of the subjects reported the same smoking habits on both questionnaires. They concluded that the use of the self-reported data improved the sensitivity of the lab tests and should be considered as the standard against which physiologic tests of smoking must be judged and not vice versa.

For this study, a large medical testing laboratory was contacted to perform SCN levels on the subjects' saliva samples at time II to corroborate the self-report of smoking behavior. Midway through the study, the laboratory declined to continue analyzing these samples due to limited technical support and staff procedural errors.

PROCEDURE

As a prospective study, the subjects were tested on the independent variables while in the hospital or under treatment (time I) and at the end of the follow-up period

(time II) for assessment on the dependent variable (smoking reduction). After signing the consent form, the subjects were asked to complete the questionnaire which consisted of demographic and smoking history data, the health locus of control, health beliefs, and health value scales, and the self-report data. Significant others were also asked to complete a report (see Appendix C, questionnaire page 14).

The course of this study, per subject, took place over a maximum time period of 50 days between the first and second interviews. The follow-up interview included smoking self-reports, reports of corroboration from significant others, and completion of the questionnaire again excluding the demographic and smoking history information (Appendices C and D, questionnaire pages 1-3). Biochemical (SCN) analysis was performed for the saliva samples obtained at the follow-up interviews, until discontinued.

Current research on smoking cessation has reported results based on as little as a 3-4 week assessment period. According to Doerfler (Schmitz, Garcia & Doerfler, 1987), recording of self-regulatory activities for more than one month is difficult for most subjects and results in incomplete data. This information is corroborated by Prue et al. in their discussion of high attrition rates with self-monitoring procedures. The use of long-term (e.g., 6 months) assessment periods is useful to determine long-term compliance, recidivism rates, and temporal variables in compliance. However, the purpose of this research was to determine the effect of psychological variables on compliance behaviors immediately following instructions to change smoking behaviors. Recording of these behaviors has been shown to be inconsistent and difficult to collect and realistically should not be expected to continue successfully over long periods of time (Moss et al., 1982; Prue et al., 1985; Schmitz et al., 1987).

ANALYSIS

For the purposes of this study, health locus of control, health beliefs and health value were considered as underlying variables for the model. Smoking levels and frequency of use of self-regulation behaviors were considered as control variables. The outcome variable is compliance, or reduction in smoking.

A multiple regression analysis was performed to determine if the variables in the model presented in this study significantly contribute to the variation in smoking reduction as stated in the hypotheses. Wallston and Wallston (1981) posit that health locus of control beliefs should predict health behavior only under high health value conditions and that health value is the most important contributor to health behavior over and above the effect of health locus of control. A more complete model would include health beliefs along with health locus of control and health value variables. These variables are analyzed as a result of the data collected for this study.

Hierarchical regression analysis is appropriate for this study since Wallston and Wallston (1981) have established the priority of intervening variables as previously mentioned. Since the predictor variables and hypotheses were selected on the basis of theoretical considerations and research discussed in the Review of the Literature, hierarchical regression was chosen to control for the order of entry of the independent variables into the regression equation in order to test the model in this research (Pedhazur, 1982; Tabachnick & Fidell, 1989). In some situations, the terms hierarchical and stepwise regression have been used inter-changeably. The main effects were entered into the regression equation in the following order: the health locus of control variables, health value, and health beliefs. The following is a list of the statistical symbols which represent the variables and regression coefficients in the regression equation $\hat{Y} = \Sigma b_i X_i$:

Independent variable		Regression coefficient
X_1	# of cigarettes smoked/24 hours	
X_2	frequency of Self-Regulatory Behaviors	b_2
X_3	Internal Health Locus of Control	b_3
X_4	Powerful Others Health Locus of Control	b_4
X_5	Chance Health Locus of Control	b_5
X_6	Health Value	b_6
X_7	Health Beliefs	b_7

Since Y represents a reduction in smoking or the difference in smoking from time I to time II, it involves the calculation of X_1 at time II minus X_1 at time I. As a result, X_1 is not included in the regression equation, per se. The part of the regression equation representing the main effects is:

$$\hat{Y} = b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7$$

The interaction effects expected, as derived from hypotheses 7 to 19, are between the health locus of control and health value variables (X_3X_6 - X_5X_6) and health locus of control with health beliefs (X_3X_7 - X_5X_7); between HV and HB (X_6X_7); and between self-regulation behaviors and IHLC (X_2X_3). Higher-order interaction terms are included among each of the MHLC variables, HV and HB together ($X_3X_6X_7$ - $X_5X_6X_7$), between self-regulation behaviors, IHLC, HV and HB ($X_2X_3X_6X_7$), and between self-regulation behaviors, PHLC, HV and HB ($X_2X_4X_6X_7$). The complete regression equation is as follows:

$$\hat{Y} = b_0 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_3X_6 + b_9X_4X_6 + b_{10}X_5X_6 + b_{11}X_3X_7 + b_{12}X_4X_7 + b_{13}X_5X_7 + b_{14}X_6X_7 + b_{15}X_2X_3 + b_{16}X_3X_6X_7 + b_{17}X_4X_6X_7 + b_{18}X_5X_6X_7 + b_{19}X_2X_3X_6X_7 + b_{20}X_2X_4X_6X_7.$$

RESULTS

This section details descriptive statistics, major analyses, and additional analyses and data. The results of the questionnaire completed by the subjects in the final sample (those who completed the interviews at time I, or the day of the first interview, and time II, the day of the follow-up interview) will be presented. Where appropriate, the results will be further broken down by diagnosis group (cardiac and pulmonary subjects). Tables representing some of the more important characteristics of the sample or the variables in the analysis are included. The results of tests for significance and the regression analysis will be presented followed by additional analyses and data.

Descriptive Statistics

History of Smoking Behaviors

For the sample, the total number of years of smoking ranged from 8 to 57 years (M = 37.12 years). The range for the cardiac group was 19-57 years (M = 39.48 years) and for the pulmonary group, 8-55 years (M = 34.75 years). Overall, more than 50% of subjects in each diagnosis group had smoked 40 years or longer but, on the average, the cardiac group had smoked longer than the pulmonary group. More specifically, during their smoking history, the number of cigarettes smoked by the cardiac subjects averaged 34.66 cigarettes a day versus 37.41 cigarettes a day for pulmonary subjects. (See Table 3.)

Over their lifetime, the maximum number of cigarettes smoked daily ranged from 15 to 60 for pulmonary subjects and from 20 to 50 for cardiac subjects. Consequently, cardiac patients may have smoked fewer cigarettes a day but smoked over a longer period of time as compared to pulmonary subjects.

Table 3

Smoking History

	Cardiac (n = 29)	Pulmonary (n = 29)	All (N = 58)
Years smoking			
Range	19-57	8-55	8-57
M	39.48	34.75	37.12
SD	10.66	14.05	12.59
Maximum daily cigarettes during lifetime			
Range	20-50	15-60	15-60
M	34.66	37.41	36.03
SD	11.33	14.06	12.73
Daily smoking prior to illness/study (cigarettes/day)			
Range	10-50	10-60	10-60
M	31.55	32.76	32.16
SD	13.27	14.24	13.66
Daily smoking during study (cigarettes/day)			
Time I: Range	0-40	0-50	0-50
M	5.07	8.90	6.98
SD	10.99	12.64	11.90
Time II: Range	0-40	0-30	0-40
M	8.10	8.35	8.22
SD	12.68	11.06	11.80

Prior to entry into the study (i.e., before becoming ill, hospitalization, and/or treatment for current condition), the daily smoking pattern for the sample ranged from 10-60 cigarettes a day (M = 32.16). The majority of the subjects smoked up to 2 packs per day (1 pack contains 20 cigarettes).

As shown in Table 3, during the study period, the number of cigarettes smoked by the sample at time I (day of first interview) ranged from 0-50 a day whereas at time II (day of follow-up interview), the range was 0-40 cigarettes daily. However, an increase in the mean for the sample was observed at time II (8.91 vs. 6.98 at time I).

Types of Smoking

Most of the subjects (n = 54, 93.10%) inhaled while smoking whereas 4 subjects (6.90%) said they only puffed on their cigarettes. Thirty-four subjects (58.62%) smoked filtered cigarettes, 19 (32.76%) smoked low tar-low nicotine filtered cigarettes, and 5 (8.62%) smoked unfiltered cigarettes. The majority (n = 50, 86.21%) smoked only cigarettes while several subjects indicated they also used other forms of tobacco products: 5 (8.62%) also smoked cigars, 2 (3.45%) also smoked a pipe, and 1 (1.72%) smoked both a pipe and cigars besides cigarettes. The pattern of type of smoking was almost identical in cardiac and pulmonary subjects.

Difference in Smoking

Overall, twenty-eight subjects (48.28%) reported not smoking at time I or time II. An increase in smoking from time I to time II was noted in 17 subjects (29.31%) while 8 subjects (13.79%) decreased smoking between the two interviews. Sixteen cardiac and 12 pulmonary patients reported not to have smoked at all at time I and remained abstinent until time II. However, 4 cardiac and 2 pulmonary subjects who reported not smoking at time I were smoking again at time II. Notably, 10 subjects (17.24%) were interviewed at time I while hospitalized. Since smoking is prohibited

within these institutions, the rate of smoking at time I for these subjects may be a consequence of the environment and not of choice, therefore, smoking relapse upon discharge is highly possible.

During the course of the study, the subjects increased smoking by an average of 1.24 cigarettes a day, although a wide range of both smoking reduction and increase was noted. Between time I and time II, smoking difference in individuals ranged from a decrease of 20 cigarettes a day to an increase of 35 cigarettes a day. (See Table 4.)

Thirty-three subjects (17 cardiac and 16 pulmonary) had no change in daily smoking pattern from time I to time II. Seventeen subjects increased smoking by a total of 131 ciagerettes on a daily basis for a combined (cardiac and pulmonary) daily average increase of 7.71 cigarettes from time I to time II for each of the 17 individuals.

The cardiac subjects increased daily cigarette consumption by 88 cigarettes for a net group average increase of 3.03 cigarettes a day during the study period (n = 29). These numbers represent the difference between a total group increase of 95 cigarettes a day (11 subjects) and a decrease in smoking by only one cardiac subject for a total of 7 cigarettes a day. An increase in smoking was observed between time I and time II for an average of 8.64 cigarettes a day for just the 11 cardiac subjects who increased smoking (eliminating the one subject who decreased smoking during this time).

In contrast, the pulmonary subjects had an overall decrease in smoking between time I and time II of 16 cigarettes per day, for a net group average of -0.55 cigarettes a day (n = 29). Six pulmonary subjects increased smoking for a group total of 36 cigarettes daily, an average increase of 6 cigarettes daily for each of these 6 individuals. However, 7 subjects from this diagnosis group decreased the quantity of cigarettes smoked per day by a total of 52 a day between time I and time II, an average decrease of 7.43 cigarettes a day for each of these 7 individuals. Combined with the one cardiac patient who also decreased smoking, a total of 8 subjects in the final sample decreased daily consumption by 59 cigarettes between time I and time II, an average daily decrease

Table 4

Change in Smoking - Time I to Time II

	Cardiac (n = 29)	Pulmonary (n = 29)	All (N = 58)
Reduction in smoking			
Number of subjects	1	7	8
% of diagnosis group	3.45%	24.14%	-
% of sample (N = 58)	1.72%	12.07%	13.79%
# total cigarettes decreased	7	52	59
% total cigarettes decreased	11.86%	88.14%	(100%)
Range cigarettes decreased	0-7	3-20	3-20
Mean # cigarettes decreased	7.00	7.43	7.38
SD	0	5.97	5.53
Increase in smoking			
Number of subjects	11	6	17
% of diagnosis group	37.93%	20.69%	-
% of sample (N = 58)	18.97%	10.34%	29.31%
# total cigarettes increased	95	36	131
% total cigarettes increased	72.52%	27.48%	(100%)
Range cigarettes increased	1-35	1-15	1-35
Mean # cigarettes increased	8.64	6.00	7.71
SD	11.13	5.06	9.33
No change in smoking	17	16	33
% of diagnosis group	58.62%	55.17%	-
Change in daily smoking (# of cigarettes)			
By group	+88	-16	+72
Range (from/to)	+35/-7	+15/-20	+35/-20
Mean change	+3.03	-0.55	+1.24
SD	8.11	5.78	7.21

of 7.38 cigarettes per each of these 8 subjects.

Quit Attempts

The number of quit attempts previously made by the sample ranged from 1 to 10 (M = 4.21). A majority of subjects (68.97%) attempted to quit smoking up to 4 times in their lifetime. The frequency of quit attempts was almost identical for cardiac and pulmonary subjects (M = 4.14 for the cardiac group; M = 4.28 for the pulmonary group).

Perceived Contribution of Smoking to Illness

The subjects were asked to rate their perception of how much their smoking may have contributed to their coronary or pulmonary conditions. Using a Likert scale (1 = no relationship to 7 = definite cause), the rating most often noted by the subjects (n = 22, 37.93%) was that smoking "had a great deal to do with" their condition. Eight subjects (13.79%) attributed a definite causal relationship between smoking and their condition, 24 (41.38%) thought smoking contributed greatly, if not directly, to their condition, 18 (31.03%) considered smoking to have contributed somewhat to their condition, and 8 (13.79%) thought smoking had little if nothing to do with their health problems.

Looking further at the two disease groups in the study to see if individuals with a certain disease state might perceive the causal relationship between smoking and disease differently, almost twice as many cardiac as pulmonary patients (14 vs. 8, respectively) attributed smoking as having a great deal to do with their conditions. However, when responses were collapsed for positive causal effect, an almost equal number of subjects from each group (17 cardiac and 15 pulmonary subjects) perceived some degree of relationship between their disease state and smoking. Similarly, an almost equal number of subjects from each group (10 cardiac and 11 pulmonary

subjects) did not perceive a causal relationship existed between their conditions and smoking.

Desire to Quit, Goals, and Predicted Success for Quitting

Of all those interviewed, 49 subjects (84.48%) expressed a desire to quit smoking while 9 subjects (15.52%) did not. On this question (as shown in Appendix C, questionnaire page 3, question #14), 24 cardiac and 25 pulmonary subjects expressed a desire to quit. Of these, 16 cardiac and 15 pulmonary subjects were not smoking at time II.

A Likert scale was used to ascertain each subject's goal for quitting or reduction in smoking (1 = return to regular pattern of smoking to 4 = to totally quit). Forty-eight subjects (82.76%) expressed their goal for smoking as totally quitting. Of these, 26 (44.83%) actually quit, 4 (6.90%) had no change in smoking level from time I to time II, 5 (8.62%) reduced smoking, and 13 (22.41%) increased smoking by time II. Two of the 13 who increased indicated they did not want to to quit. Only one subject (1.72%) indicated that the goal for smoking was to only quit for awhile. This individual had no change in smoking pattern from time I to time II but also indicated that they did not want to quit.

Five subjects (8.62%) wished to cut down on smoking but of these, only one subject (1.72%) actually achieved this goal. Two subjects (3.45%) had no change in smoking while 2 (3.45%) increased smoking from time I to time II. In each of these pairs of subjects, one subject indicated that they really did not want to quit. None of the sample indicated that they would return to their usual pattern of smoking while 4 subjects (6.90%) did not answer the question.

Twenty-three coronary and 25 pulmonary subjects rated their smoking goal as completely quitting. Of these, 14 cardiac and 13 pulmonary subjects were not smoking at time II. Six subjects (3 cardiac and 3 pulmonary) indicated that they would decrease

smoking. By time II, 1 pulmonary and 2 cardiac subjects either reduced smoking or were not smoking at all.

The subjects were also asked to rate their future success of attaining their goals for quitting using a Likert scale (1 = cannot quit to 5 = will quit altogether). Thirty-seven subjects (63.79%) predicted that they would successfully quit smoking altogether. Of these, 25 (43.10%) actually quit, 2 (3.45%) had no change in smoking from time I to time II, 2 (3.45%) reduced smoking, and 8 (13.79%) increased smoking. One of these 8 individuals indicated they did not want to quit smoking. Three subjects (5.17%) responded that they would quit smoking for awhile. Of these, 1 (1.72%) actually did quit, 1 (1.72%) reduced smoking while 1 (1.72%) increased smoking by time II.

Eight individuals indicated that they would successfully reduce smoking levels. Of these, 3 (5.17%) actually quit even after one said they did not want to quit. One subject (1.72%) was successful in reducing smoking while 4 (6.90%) increased smoking. One subject (1.72%) responded that they would return to their usual pattern of smoking and that they did not want to quit smoking. However, no change in smoking was noted for this subject from time I to time II.

Five subjects (8.62%) indicated they could not quit smoking. Of these, none quit, 2 (3.45%) reduced smoking, 2 (3.45%) increased smoking and 1 subject had no change in quantity of cigarettes smoked from time I to time II. Both of the individuals who increased smoking indicated that they did not want to quit. Four subjects (6.90%) did not respond to this question; 3 of these, however, indicated that they did not want to quit smoking.

Little difference was noted between diagnosis subgroups: 18 coronary versus 19 pulmonary subjects predicted that they would successfully quit smoking altogether. Of these, 13 cardiac and 12 pulmonary subjects were not smoking at time II. Eleven subjects (6 cardiac and 5 pulmonary) indicated that they would quit for awhile or

reduce smoking. Of these, 2 each from the cardiac and pulmonary subgroups either quit or reduced smoking by time II.

Importance of Smoking

A Likert rating scale was also used to indicate the importance of smoking to each subject (1 = not at all important to 7 = very important). Seventeen subjects (29.31%) indicated that smoking was either very pleasurable or very important, 21 (36.21%) indicated that smoking was pleasurable for them, 13 (22.41%) said that smoking is just a habit or somewhat pleasurable, and 7 (12.07%) felt that smoking was not at all important to them or somewhat of a habit.

Physician's Advice

Asked if they had been given advice by their physicians to stop smoking, 51 subjects (87.93%) admitted to having received such advice whereas 7 subjects (12.07%) said they had not been so advised. Of the 51 subjects instructed to stop smoking, a majority agreed that they were strongly advised to do so by their physicians. Using a Likert scale (1 = casually mentioned to 7 = quitting is of utmost importance), 43 subjects (74.14%) indicated that they were strongly advised to quit or that quitting was of utmost importance to their health; 8 individuals (13.79%) ranked the advice given to them as being less emphatic (not a priority) or casually mentioned. Seven subjects (12.07%) failed to provide an answer because they did not recall being instructed by their physician to quit smoking.

Symptoms Reported

Subjects were asked to report physical symptoms common in cardiac and pulmonary disease based on occurrence and frequency. Of the 14 types of symptoms (as listed in Appendix C, questionnaire page 2, question #11), a majority of subjects

reported experiencing 2 to 8 symptoms, the average being 4.85 per person (SD = 3.68). The symptoms reported with the highest frequencies were: shortness of breath (n = 39, 67.24%), coughing and gagging (n = 36, 62.07%), phlegm and mucus (n = 34, 58.62%), and throat irritation (n = 25, 43.10%).

SMOKING SELF-REPORT

The subjects' self-reports yielded results regarding smoking behaviors on each interview day in addition to personal information as described in the following section. This report is shown in Appendix C, questionnaire pages 11-13.

Day's Smoking Goal

Subjects were asked to note their smoking goal on the day of interview as smoking when they felt like it, reducing the number of cigarettes smoked for that day, or attempting not to smoke at all. Interview I compared to interview II, respectively, showed little difference in response: 62.07% vs. 63.79% (36 vs. 37 subjects) wanted not to smoke at all, 17.24% vs. 12.07% (10 vs. 7 subjects) wanted to cut down the number of cigarettes smoked for that day, and 20.69% vs. 24.14% (12 vs. 14 subjects) chose to smoke when they felt like it.

Urges and Smoking Behavior

At the time I interview, 37 subjects (63.79%) said they had an urge to smoke that day while 21 (36.21%) said they had no desire to smoke. At interview II, 45 subjects (77.59%) had an urge to smoke while only 13 (22.41%) did not. In relation to these urges, Table 5 reports subjects who smoked the day of both interviews. Overall, 6 subjects resumed smoking, representing 10.34% of the sample who relapsed during the course of the study period.

Table 5

Smoking Behaviors on Days of Interviews - Time I and Time II

	Cardiac[a]		Pulmonary[a]		All[b]	
Time	TI	TII	TI	TII	TI	TII
# Ss who smoked	9	13	15	17	24	30
% of diagnosis subgroup	31.03%	44.83%	51.72%	58.62%	-	-
% of final sample					41.38%	51.72%
Difference (TI vs. TII)	(13.80%)		(6.90%)		(10.34%)	
# Ss who did not smoke	20	16	14	12	34	28
% of diagnosis subgroup	68.97%	55.17%	48.28%	41.38%	-	-
% of final sample					58.62%	48.28%

a n = 29
b N = 58

Self-Regulatory Behaviors

An overall reduction in use of self-regulatory behaviors by subjects to avoid smoking occurred from time I to time II; means are presented in Table 6. A significant t-test resulted and will be discussed later. Comparison of reports from the first and second interview resulted in noting an overall reduction in usage for 17 out of 25 behaviors (as listed in Appendix C, questionnaire page 12, question #6): # 1, 3, 6, 8, 9, 11-16, 18-20, 22, 23, and 25. Four behaviors showed an increase in use (#4, 5, 7 and 10) while 4 remained unchanged (#2, 17, 21 and 24). Twenty-five subjects decreased the number of self-regulatory behaviors used by the second interview while 7 subjects increased the number used; 26 subjects remained unchanged in their usage pattern of these behaviors.

Efforts Made to Avoid Smoking

When asked to describe if they had made any conscious effort to avoid smoking either during their history of smoking or within the last month before each interview, little difference resulted in responses from time I to time II. For efforts made over the course of smoking history, 37 subjects (63.79%) responded affirmatively at time I versus 30 (51.72%) at time II. For efforts made during the month prior to interview, 23 subjects (39.66%) responded affirmatively at time I versus 15 (25.86%) at time II. These efforts typically included such things as hypnosis, self-help groups, stop smoking aids, or "going cold turkey."

Table 6

Means and Change in Use of Self-Regulatory Behaviors

	Cardiac (n = 29)	Pulmonary (n = 29)	All (N = 58)
Day of first interview			
M	2.17	2.24	2.20
SD	2.70	3.15	2.91
Day of second interview			
M	1.35	1.21	1.28
SD	2.16	2.18	2.15
Mean Change			
M	-0.83	-1.04	-0.93
SD	1.75	2.20	1.97

SIGNIFICANT OTHER REPORTS

Individuals closely related to or friendly with the subjects were asked to identify smoking behaviors of the subjects which they observed or knew about. Table 7 describes the reports of these significant others.

Table 7

Significant Other Reports - Time I vs. Time II

	Time I	Time II
Observed Ss smoking:		
Day of interview	14 (24.14%)	20 (34.48%)
Range cigarettes observed smoking	1-24	1-18
Within week prior to interview	26 (44.83%)	25 (43.10%)
Range cigarettes observed smoking	1-99+	1-99+
Within month prior to interview	32 (55.17%)	26 (44.83%)
Range cigarettes observed smoking	1-99+	1-99+
Provided encouragement to avoid smoking		
Yes	39 (67.24%)	35 (60.34%)
No	19 (32.76%)	23 (39.66%)
Encouragement or support from others		
Yes	23 (39.66%)	23 (39.66%)
No	35 (60.34%)	35 (60.34%)
Significant other smoking		
Yes	18 (31.03%)	17 (29.31%)
No	40 (68.97%)	41 (70.69%)

A 10.34% increase in significant others observing subjects smoking occurred between time I and time II. A corresponding increase (10.34%) in the self-reports of smoking by the subjects also occurred at time II (Table 5). According to Table 7, more subjects were observed smoking during the month prior to entering the study then during the study period.

Major Analyses and Hypothesis Testing

Means and Paired t-Tests

In order to examine the effect of time on the health-related constructs, paired t-tests were performed comparing time I and time II for the group as a whole and for each diagnosis subgroup. These results and the means of the regression variables are presented in Table 8. As can be seen for all subjects from this table, the differences between times I and II were not significant except for the frequency of self-regulatory behaviors used which was significantly reduced by time II. These results remained consistent across the two diagnosis subgroups.

Correlation Coefficients

The correlation coefficients for all the regression variables are presented in Table 9. A number of significant correlations resulted from this analysis, which may be due to intercorrelation effects, and will be discussed in the next section. None of the variables significantly correlated with the dependent variable or smoking at either time either time I or time II.

Table 8

Paired t-Tests and Means for Regression Variables - Time I vs. Time II

	Cardiac[a]		Pulmonary[a]		All[b]	
Time	I	II	I	II	I	II
Variable (scale range)						
X_1 Cigarettes (0-60)						
Range	0-40	0-40	0-50	0-30	0-50	0-40
M	5.07	8.10	8.90	8.35	6.98	8.91
SD	10.99	12.68	12.64	11.06	11.90	12.46
t	2.02		-0.51		1.31	
p	.054		.61		.20	
X_2 Self-regulatory behaviors (0-25)						
Range	0-8	0-8	0-11	0-7	0-11	0-8
M	2.17	1.35	2.24	1.21	2.21	1.28
SD	2.70	2.16	3.15	2.18	2.91	2.15
t	-2.54		-2.54		-3.60	
p	.017*		.017*		.0007***	

(continued)

Table 8 continued

		Cardiac[a]		Pulmonary[a]		All[b]	
	Time	II	III	II	III	II	III
X_3	Internal health locus of control (6-42)						
	Range	19-41	18-42	18-40	19-42	18-41	18-42
	M	31.48	30.00	30.69	30.69	31.09	30.35
	SD	6.30	6.49	5.92	5.89	6.07	6.15
	t	-1.65		0.00		-1.32	
	p	.11		1.00		.19	
X_4	Powerful others health locus of control (6-42)						
	Range	6-41	12-42	6-42	10-41	6-41	10-42
	M	24.62	25.28	23.31	25.10	23.97	25.19
	SD	8.83	8.37	7.10	6.94	7.97	7.62
	t	0.62		1.88		1.72	
	p	.54		.07		.09	
X_5	Chance health locus of control (6-42)						
	Range	6-32	6-40	8-34	7-38	6-34	6-40
	M	18.52	19.90	21.28	20.48	19.90	20.19
	SD	7.37	8.54	5.87	7.28	6.75	7.87
	t	1.46		-0.90		0.45	
	p	.15		.38		.66	

(continued)

Table 8 continued

	Time	Cardiac[a] II	Cardiac[a] III	Pulmonary[a] II	Pulmonary[a] III	All[b] II	All[b] III
X_6	Health value (4-28)						
	Range	16-28	14-28	9-28	14-28	9-28	14-28
	M	23.35	23.31	21.00	20.59	22.17	21.95
	SD	3.54	3.66	5.01	4.19	4.46	4.13
	t	-0.06		-0.73		-0.58	
	p	.95		.47		.57	
X_7	Health beliefs (12-84)						
	Range	44-82	45-77	36-72	34-67	36-82	34-77
	M	57.86	56.62	54.48	55.90	56.17	56.26
	SD	9.13	7.54	8.49	8.53	8.90	7.99
	t	-1.29		1.70		0.13	
	p	.21		.10		.90	

a n = 29

b N = 58

*p<.05, ***p<.001

Table 9

Correlation Matrix for Regression Variables [a]

	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_3X_6	X_4X_6
X_1	-.32									
X_2	.02	.03								
X_3	.16	-.21	.24							
X_4	-.03	-.18	.14	.39**						
X_5	-.09	.04	.01	-.10	-.01					
X_6	-.07	-.24	.05	.21	.20	-.22				
X_7	-.07	-.07	.17	.10	.45***	.07	.31*			
X_3X_6	.15	-.30	.17	.77****	.40	-.20	.76****	.23		
X_4X_6	-.01	-.24	.12	.42***	.90****	-.07	.58****	.46***	.67****	
X_5X_6	-.02	-.12	.14	.02	.14	.81****	.40	.27**	.25*	.29*
X_3X_7	.08	-.19	.30*	.81****	.54****	-.03	.30*	.64****	.70****	.56****
X_4X_7	-.06	-.15	.17	.32*	.94****	.05	.24	.72****	.37**	.86****
X_5X_7	-.10	-.01	.12	-.05	.21	.90****	-.03	.47***	-.07	.16
X_6X_7	.01	-.21	.11	.17	.38**	-.09	.85****	.75****	.64****	.65****
X_2X_3	.03	-.02	.99****	.31*	.19	.09	.05	.20	.22	.16
$X_3X_6X_7$	.09	-.28	.21	.69****	.51****	-.13	.72****	.58****	.91****	.72****
$X_4X_6X_7$	-.03	-.21	.14	.35**	.88****	.00	.53****	.67****	.58****	.95****
$X_5X_6X_7$	-.03	-.14	.12	.02	.28*	.73****	.42**	.54****	.26*	.41**
$X_2X_3X_6X_7$	.04	-.09	.93****	.33**	.24	.04	.19	.29*	.33*	.26*
$X_2X_4X_6X_7$	.01	-.13	.88****	.32*	.36**	.04	.19	.32*	.31*	.36*

(continued)

Table 9 continued

	X_5X_6	X_3X_7	X_4X_7	X_5X_7	X_6X_7	X_2X_3	$X_3X_6X_7$	$X_4X_6X_7$	$X_5X_6X_7$	$X_2X_3X_6X_7$	$X_2X_3X_6X_7$
X_3X_7	.15										
X_4X_7	.22	.64****									
X_5X_7	.84****	.22	.36**								
X_6X_7	.43***	.54****	.56****	.25							
X_2X_3	.12	.37**	.22	.12	.12						
$X_3X_6X_7$	.31*	.86****	.59****	.13	.81****	.26*					
$X_4X_6X_7$	.34**	.63****	.94****	.30*	.75****	.18	.75****				
$X_5X_6X_7$	.95****	.30*	.43***	.88****	.60****	.12	.42***	.52****			
$X_2X_3X_6X_7$	.17	.44***	.29*	.11	.28*	.95****	.40**	.29*	.18		
$X_2X_4X_6X_7$	.17	.44***	.39**	.13	.29*	.90****	.40**	.37**	.20	.97****	

[a] N = 58 *p<.05 **p<.01 ***p<.001 ****p<.0001

Legend:

X1 Cigarettes
X2 Self-regulatory behaviors (SR)
X3 Internal health locus of control (I)
X4 Powerful others health locus of control (P)
X5 Chance health locus of control (C)
X6 Health value (V)
X7 Health beliefs (B)
X3X6 I x V
X4X6 P x V
X5X6 C x V
X3X7 I x B
X4X7 P x B
X5X7 C x B
X6X7 V x B
X2X3 SR x I
X3X6X7 I x V x B
X4X6X7 P x V x B
X5X6X7 C x V x B
X2X3X6X7 SR x I x V x B
X2X4X6X7 SR x P x V x B

Regression Analysis

Table 10 presents the regression coefficients (standardized and unstandardized beta weights) and R^2 value for testing the model using a hierarchical method, i.e., the regression variables were entered into the equation according to the theory presented in the review of the literature. A SAS regression analysis (SAS Institute Inc., 1985) was used to determine the values presented in the table. Based on this procedure and the model used, only 19.39% (N.S.) of the variance in the model can be explained by the variables. Since this is a predictive model, the values used in the equation were those reported by the subjects at time I to determine if they would predict a difference (reduction) in smoking at time II.

In this model, the control variable X_1 (number of cigarettes smoked) was used in the calculation of Y as the difference in smoking from first to second interview: X_1 at time II minus X_1 at time I. Variable X_1, therefore, controls for the quantity of cigarettes smoked at time I when predicting smoking behavior at time II. As a result, X_1 does not appear in the regression table.

None of the regression coefficients were significant and the incremental squared semi-partial correlation coefficients for each variable and interaction effects entered into the equation were very small. The test for significance for R^2 resulted in an $F(19, 57)$ value of 0.48 (N.S.); $R^2 = 0.1939$. The multiple R for the model, representing the correlation between the obtained and predicted values for Y, is 0.44 (N.S.).

The squared semi-partial correlation coefficients provide information as to the incremental proportion in the variance in the dependent variable accounted for by a given independent variable after another variable has been partialed out or has already been taken into account. These coefficients depend on the order in which the independent variables are entered into the analysis so that a determination of the proportion of the variance incremented by each of the variables can be made (Pedhazur, 1982).

Table 10

Regression Table for Hierarchical Model

	Regression Coefficients			Squared Semi-partial
	Standardized (β)	Unstandardized (b)	p	Correlation (sr^2)
X_2 (SR)	1.40	3.48	.32	.001
X_3 (IHLC)	-4.51	-5.35	.54	.024
X_4 (PHLC)	20.26	18.34	.12	.009
X_5 (CHLC)	3.75	4.00	.65	.005
X_6 (HV)	5.47	8.85	.51	.001
X_7 (HB)	5.28	4.27	.49	.004
X_3X_6	8.78	0.30	.44	.000
X_4X_6	-24.72	-0.77	.13	.022
X_5X_6	-3.91	-0.17	.66	.047
X_3X_7	6.47	0.10	.57	.000
X_4X_7	-25.15	-0.29	.16	.002
X_5X_7	-5.27	-0.09	.58	.006
X_6X_7	-7.27	-0.15	.53	.006
X_2X_3	-1.42	-0.11	.44	.013
$X_3X_6X_7$	-9.97	-0.01	.50	.000
$X_4X_6X_7$	27.14	0.01	.17	.047
$X_5X_6X_7$	5.71	0.00	.59	.007
$X_2X_3X_6X_7$	0.19	0.00	.89	.000
$X_2X_4X_6X_7$	-0.12	-0.00	.89	.000

Constant: -262.50

Further analyses were applied to variables which most closely approached significance in the model: X_4 (PHLC), X_4X_6 (PHLC x HV), X_4X_7, (PHLC x HB), and $X_4X_6X_7$ (PHLC x HV x HB). In the case of each of these variables, as noted in Table 10, a p value of between .12 and .17 resulted from the regression analysis; the p values of the other regression variables were much greater.

For the main effects and interactions involving X_4, as stated above, the increments in proportion of variance accounted for by each of these 4 variables was tested for significance (Pedhazur, 1982). None were significant. Therefore, the increments in the proportion of the variance due to X_4 (PHLC), X_4X_6 (PHLC x HV), X_4X_7, (PHLC x HB), and $X_4X_6X_7$ (PHLC x HV x HB) did not significantly contribute to the model.

Hypotheses

The proposed model was not significant in predicting smoking reduction from the variables used. These variables contributed only somewhat (19.39%) to the variance associated with the change in smoking from time I to time II. Similarly, none of the research hypotheses were supported. Thus, none of these hypotheses were significantly different from zero (or true) for the study sample as described below.

The first and second hypotheses were concerned with the two control variables of daily smoking consumption and use of self-regulatory behaviors on the day of interview.

Hypothesis 1: The number of cigarettes smoked per day by each individual did not account for a significant amount of the variation in smoking reduction over and above the health locus of control, health value and health belief variables.

Hypothesis 2: The frequency of self-regulatory behaviors used did not account for a significant amount of the variation in smoking reduction over and above the health locus of control, health value and health belief variables.

Hypotheses 3 to 5 tested the relationship expected from selected predictor variables based on the literature.

Hypothesis 3: Internal health locus of control (IHLC) did not account for a significant amount of the variation in smoking reduction over and above powerful others and chance health locus of control (PHLC and CHLC, respectively).

Hypothesis 4: Powerful others health locus of control (PHLC) did not account for a significant amount of the variation in smoking reduction over and above CHLC.

Hypothesis 5: Health value (HV) did not account for a significant amount of the variation in smoking reduction over and above the effect of each of the health locus of control variables, i.e., over and above IHLC, PHLC, and CHLC.

Hypothesis 6 tested the relationship expected between all the predictor variables and health beliefs (HB).

Hypothesis 6: Health beliefs did not contribute significantly to the variation in smoking reduction over and above each of the health locus of control variables (IHLC, PHLC, and CHLC) and health value.

Hypotheses 7 to 9 tested the relationship expected between each of the health locus of control variables and health value.

Hypothesis 7: High scores on the IHLC scale (than PHLC or CHLC) and the HV scale did not account for a significant amount of the variation in smoking reduction over and above high IHLC scores and low HV scores.

Hypothesis 8: High scores on the PHLC and HV scales did not account for a significant amount of the variation in smoking reduction over and above high PHLC scores and low HV scores.

Hypothesis 9: High scores on the CHLC and HV scales did not account for a significant amount of the variation in smoking reduction over and above high CHLC scores and low HV scores.

Hypotheses 10 to 12 tested the relationship expected between each of the health locus of control variables and health beliefs.

Hypothesis 10: High scores on the IHLC and HB scales did not account for a significant amount of the variation in smoking reduction over and above high IHLC scores and low HB scores.

Hypothesis 11: High scores on the PHLC and HB scales did not account for a significant amount of the variation in smoking reduction over and above high PHLC scores and low HB scores.

Hypothesis 12: High scores on the CHLC and HB scales did not account for a significant amount of the variation in smoking reduction over and above high CHLC scores and low HB scores.

Hypotheses 13 and 14 tested two-way interaction effects between the health value and health belief variables and between self-regulatory behaviors and internal health locus of control, respectively.

Hypothesis 13: High scores on both the health value and health belief measures did not account for a significant amount of the variation in smoking reduction over and above either high scores on only one of the measures or low scores on both.

Hypothesis 14: High scores on the IHLC scale coupled with frequent use self-regulatory behaviors did not account for a significant amount of the variation in smoking reduction over and above high PHLC or CHLC scores or infrequent use self-regulatory behaviors.

Hypotheses 15 to 17 tested the relationship expected between each of the health locus of control, health value and health belief variables.

Hypothesis 15: High scores on the IHLC, HV and HB scales did not account for a significant amount of the variation in smoking reduction over and above high IHLC scores and low HV and HB scores.

Hypothesis 16: High scores on the PHLC, HV and HB scales did not account for a significant amount of the variation in smoking reduction over and above high PHLC scores and low HV and HB scores.

Hypothesis 17: High scores on the CHLC, HV and HB scales did not account for a significant amount of the variation in smoking reduction over and above high CHLC scores and low HV and HB scores.

Hypotheses 18 and 19 test the interaction effects expected between two of the health locus of control variables, health value, health beliefs, and self-regulatory behaviors.

Hypothesis 18: High scores in the IHLC, HV and HB measures, and the frequent use of self-regulatory behaviors did not significantly contribute to a reduction in smoking in chronically ill subjects.

Hypothesis 19: High scores in the PHLC, HV and HB measures, and the frequent use of self-regulatory behaviors did not significantly contribute to a reduction in smoking in chronically ill subjects.

Additional Analyses and Data

Other information gathered in this study were analyzed to determine their contribution to the description of the sample and to the concepts underlying this research. Those analyses and descriptions are presented in this section.

Regression Analyses

Since two disease groups were included in this study, additional regression analyses were performed on the model for each disease subgroup. As before, the model was not supported by the data. However, the amount of variance explained by the model

when more homogeneous groups were used increased but not significantly. For example, for the coronary group, R^2 = .5543 (N.S.) and for the pulmonary group, R^2 = .7199 (N.S.). Two regression coefficients (b) only approached significance in the analysis of the coronary group (these were for powerful others health locus of control, and powerful others health locus of control by health value). Four regression coefficients (b) for the pulmonary group were significant ($p<.05$). These were for internal health locus of control (IHLC), IHLC x health value (HV), IHLC x health beliefs (HB), and IHLC x HV x HB. Though these results appear interesting, caution must be noted in their interpretation since the sample size was low and the number of variables in the model high.

Due to the difference in these values for R^2, a regression analysis was performed to attempt to control for the effects of disease on the results of the model. A dummy variable for disease was created where (0,1) values were assigned to each diagnosis condition (cardiac = 1, pulmonary = 0). The variable was entered first in the model equation followed by the independent variables and interaction effects in the same order previously entered. The results added little to what was already determined by the original regression analysis on the entire sample. The new value for R^2 when controlling for disease state was .2357 (N.S.). Again, as in the original model, none of the unstandardized beta weights were significant nor did any approach significance in this case. As a result of attempting to control for the two different disease states within the sample, a small difference of only 4.18% of the variance in smoking reduction was accounted for by adding the dummy variable (19.39% vs. 23.57%).

Further regression analyses were performed based on the fact that some of the subjects were initially interviewed while in hospital which may have caused a skewing of the results in terms of unrealistic smoking behaviors. For example, had the subject not been hospitalized, causing all smoking to cease, (1) actual smoking levels at time I

may have been higher than reported and (2) the difference in smoking between time I and time II may have been lower for those individuals who relapsed after discharge.

A regression analysis utilizing the smoking history of each subject immediately prior to either hospitalization or treatment was entered into the equation as X_1 (daily cigarettes smoked); Y was again calculated as cigarettes smoked at time II minus cigarettes smoked at time I. Very little was added to the variance with this new addition to the model: R^2 = .1942 (N.S.) versus the original model where R^2 = .1939. Similarly, when a regression was performed with Y as a reduction in smoking but retaining X_1 (daily cigarettes smoked) for time I in the equation, little was added to the variance in the model controlled by the variables: R^2 = .2335 (N.S.).

To test for multicollinearity among the variables, regression analyses were performed for equations containing only the main effects variables. From the hypothesized (full) regression formula, only X_2-X_7 were tested; R^2 (.0435) was not significant. When X_1 was entered into this equation, similar nonsignificant results occurred (R^2 = .1329). Thus, the amount of variance explained by the model is enhanced by the addition of the interaction effects in the regression equation and multicollinearity does not appear to be a serious problem.

Smoking-Related Variables

Results of questions related to subjects' perceptions about smoking and quitting were presented in the section on descriptive statistics. In this section, the means of these variables (Table 11) and a correlation matrix are presented (Table 12) showing the relationship among these variables with smoking levels (number of cigarettes smoked per day) at time I and time II. The variables include: the subject's desire to quit (or reduce smoking), goal for quitting and rating of predicted success for quitting, the importance of smoking for the subject, perception of contribution of smoking to disease, if physician provided advice to quit and the rating of this advice. These questions were

Table 11

Means of Smoking-Related Variables [a]

	M	SD	Range
Cigarettes at Time I	6.98	11.90	0-50
Cigarettes at Time II	8.32	11.80	0-40
Desire to quit	0.85	0.37	0-1 [b]
Goal for quitting	3.55	1.13	0-4 [c,d]
Success at quitting	3.93	1.66	0-5
Importance of smoking	4.64	1.87	1-7
Contribution of smoking to disease	4.28	1.72	1-7
Physician advised quitting	0.88	0.33	0-1 [b]
Rating of physician's advice	4.62	2.29	0-7

[a] N = 58
[b] categorical variable
[c] Likert scale
[d] zero indicates no answer

Table 12

Correlation Matrix for Smoking-Related Variables

	Cigarettes at Time I	Cigarettes at Time II	Desire to quit	Goal for quitting	Success at quitting	Smoking importance	Contribution to disease	MD advice	Advice rating
Cigarettes-TI									
Cigarettes-TII	.82****								
Desire to quit	-.28*	-.49****							
Goal	-.24	-.41**	.72****						
Success	-.59****	-.71****	.68****	.74****					
Importance	.38**	.38**	-.29*	-.25	-.44***				
Contribution	.12	-.10	.29*	.20	.19	.03			
MD advice	.22	.14	.13	.08	-.02	.33*	.31*		
Advice rating	.15	.05	.14	.09	-.02	.38**	.16	.75****	

*p<.05 **p<.01 ***p<.001 ****p<.0001

asked as part of the smoking history questionnaire (as shown in Appendix C, questionnaire page 3, questions #12-15).

A number of significant correlations resulted from this analysis (Table 12). The desire to quit (or reduce smoking) was negatively correlated with the number of cigarettes smoked each day both at time I and time II, but much more so at time II ($p<.0001$ vs. $p<.05$ at time I). The desire to quit was also highly correlated, positively, with the subjects' perceived goal for quitting and success at being able to quit. The predicted success for quitting was highly and negatively correlated with the number of cigarettes smoked at both time I and time II. The importance of smoking to the individual was identically correlated to the smoking levels at time I and time II, and was negatively correlated to the desire to quit and to the predicted success at quitting.

The perceived contribution of smoking to the individual's disease state was positively correlated to the desire to quit. The fact that physicians advised subjects to quit smoking positively correlated to the level of importance of smoking to the individual and to the perceived contribution of smoking to disease. The rating given the physicians' advice to quit smoking was positively related to the importance of smoking to the individual and, as would be expected, the occurrence of advice being given.

Smoking Validity - Thiocyanate (SCN) Test

From the 20 saliva samples submitted for testing, only 9 samples yielded quantitative results. However, of these 9, results for 2 were incorrectly reported in terms of scientific units of measure so that the results did not correspond to the smoking behavior of the two subjects involved. In addition, two other samples reported unusually low SCN levels when the subjects had admitted to smoking at least one pack (20) of cigarettes that day. Since these 4 samples were reported analyzed on the same day, it is possible that the erroneous results could have been due to either technician error or decomposition of the frozen samples in transit to the lab by transporting personnel.

However, follow-up with laboratory personnel did not provide a definitive answer or recommendations for rectifying the situation.

After continued discussion with lab personnel regarding quality control of samples and their analyses, the company declined to continue these tests due to: (a) difficulty in maintaining quality control of the samples, (b) lack of a standard with which to compare the saliva samples (only serum standards were available), (c) difficulty in converting analytical procedures from serum to saliva samples, and (d) lack of a sufficient volume of samples (i.e., quantity of samples to perform efficient batch testing by technical personnel and equipment). Thus after submitting 20 samples and successfully obtaining only 5 analytical results which mathematically corresponded to the smoking pattern of the subjects involved, the validation procedure was terminated. Since all the results obtained were suspect, however, none of these results are presented nor statistically correlated to related findings.

Comparison of Original to Final Sample of Subjects

The original pool of subjects consisted of 71 individuals, 34 cardiac and 37 pulmonary patients. As previously explained, due to refusals and one patient death, 13 subjects did not complete the study. Table 13 describes the group of 71 subjects compared to the 58 who completed the study based on the data gathered during the first interview. The data presented in this table reflect descriptive statistics regarding sample characteristics and regression variables.

No significant differences were found when the two samples were statistically compared via *t*-tests. Thus, the sample completing the study was no different from the pool of subjects who originally entered but did not complete the study.

Table 13

Comparison of Samples

	N = 71 [a]	N = 58 [b]
Age		
M	53.17	53.85
SD	12.57	12.73
Gender		
M	39 (54.93%)	33 (56.90%)
F	32 (45.07%)	25 (43.10%)
Illness relapse		
Y	17 (23.94%)	14 (24.14%)
N	54 (76.06%)	44 (75.86%)
Years smoking		
Range	8-57	8-57
M	36.18	37.12
SD	12.36	12.59
Maximum daily cigarettes during lifetime		
Range (cigarettes/day)	15-60	15-60
M	36.07	36.04
SD	12.73	12.73
Daily smoking prior to illness/study		
Range (cigarettes/day)	10-60	10-60
M	32.31	32.16
SD	13.86	13.66
Daily smoking at time 1 (X_1)		
Range (cigarettes/day)	0-50	0-50
M	7.94	6.98
SD	12.10	11.90

(continued)

Table 13 continued

	N = 71 [a]	N = 58 [b]
Self-regulatory behaviors (X_2)		
Range (#/day)	0-11	0-11
M	1.89	2.21
SD	2.73	2.91
Internal health locus of control (X_3)		
Range of scores/sample	16-41	18-41
M	30.18	31.09
SD	6.24	6.07
Powerful others health locus of control (X_4)		
Range of scores/sample	6-41	6-41
M	24.44	23.97
SD	7.53	7.97
Chance health locus of control (X_5)		
Range of scores/sample	6-36	6-34
M	20.72	19.90
SD	6.92	6.75
Health value (X_6)		
Range of scores/sample	9-28	9-28
M	21.80	22.17
SD	4.57	4.46
Health beliefs (X_7)		
Range of scores/sample	36-82	36-82
M	55.13	56.17
SD	8.96	8.90

[a] Subjects who entered the study.
[b] Subjects who completed the study.

DISCUSSION

This study examines a test of a predictive model for the reduction of smoking in chronically ill individuals based on the theoretical constructs of health locus of control, health value, health beliefs, and use of self-regulatory behaviors. The importance of the independent variables in the prediction equation was pre-determined according to theory, therefore, the devised model was tested via a hierarchical regression analysis (Tabachnick & Fidell, 1989). The results of this analysis were unable to support the model as significantly predictive.

The study yielded a variety of results, both descriptive and statistical, which will be discussed. Anecdotal information relating to the results are also discussed.

Descriptive Statistics

Difference in Smoking

On the basis of the entire sample of 58 subjects, over the duration of the study, the cardiac group had a greater overall change (increase) in smoking than did the pulmonary group. Tables 2 and 3 show that the cardiac subjects smoked an average of almost 5 years longer than the pulmonary patients. However, the cardiac group was also older than the pulmonary group by approximately 5 years.

The differences in smoking behaviors found in this study may be due to a number of reasons. First, some cardiac subjects quit smoking while still hospitalized after a cardiac event but relapsed once they returned home. Due to current smoking laws, smoking is prohibited in any hospital within New York City, therefore, patients, staff and visitors are not allowed to smoke anywhere within a hospital. As a result, restrictions are eliminated once the patient leaves the hospital and must rely on other measures to abstain from smoking. Reasons for recidivism offered by many cardiac

subjects during the interviews included: (1) they were frightened and anxious because of their condition and smoking "relaxed" them, (2) coping with their illness was difficult and smoking helped them cope, and (3) they could not adjust to the changes in their lifestyle (or health requirements) and quit smoking at the same time.

Similar effects were seen with the cardiac subjects associated with the cardiac rehabilitation unit and with the pulmonary subjects associated with the outpatient clinic. In each case, smoking was prohibited while at the rehabilitation center or while at the clinic in the hospital. Further, when being tested for either cardiac exercise or pulmonary function tests, patients were asked to refrain from smoking for the period prior to testing. However, those who chose to smoke continued to do so despite environmental restrictions, warnings and reminders from health professionals.

Second, some cardiac subjects quit smoking while in the hospital and remained abstinent once discharged. Therefore, the number of subjects who actually quit (reduced) smoking from time I to time II may be deflated since these subjects were not identified as smokers at time I but actually were smoking immediately prior to their cardiac event. Hospitalization, or the enforcement of non-smoking status, induced what may have been a false and/or temporary state of smoking cessation.

Third, due to the fact that deleterious consequences of smoking, as might be observed by physical symptoms, may be more obvious to the pulmonary subject (e.g., wheezing, shortness of breath, coughing) than to the cardiac subject, wellness behaviors for the pulmonary group would likely include not smoking. Interestingly, one would expect pulmonary patients to stop smoking because their symptoms (difficulty in breathing, etc.) are obvious signs of unhealthy conditions. However, a number of smoker-pulmonary subjects with serious conditions in this study were (1) aware that their condition probably would not improve should they quit smoking and (2) refused to refrain from smoking in order to alleviate their symptoms.

For the cardiac group, once these patients are over their cardiovascular episode, many will not have lasting adverse effects from the incident, i.e., they will remain symptom-free, which may contribute to the relapse to smoking behavior. Only occasionally did any of the cardiac subjects in this study who continued to smoke indicate that they experienced chest pain, shortness of breath, etc. Most of these symptoms occurred on exertion or during rehabilitation exercise and not while smoking. Thus, many cardiac subjects did not attribute smoking as a correlary to their disease and as something that should be avoided, despite warnings.

Lastly, the number of cigarettes smoked may be directly related to the ability to quit. It may be easier for someone to quit or reduce smoking if they are only smoking, e.g., 7 cigarettes a day than if smoking 40 cigarettes daily. As a result, the individual may not think quitting is a problem. Also, the individual may not perceive him/herself a smoker since the number of cigarettes consumed a day is relatively small. This is especially so if the person has already reduced smoking from a larger quantity in the past. Several subjects in this study indicated this on interview and professed that they could quit any time they wanted to. Having reduced smoking or even having quit in the past, relapse was evident and staying abstinent seems to have been a dilemma for these subjects, even though a majority of the sample indicated that they wanted to quit smoking altogether.

It was surprising, but not unexpected, to see the number of subjects, although relatively few, who had just experienced a major coronary or pulmonary event and who refused to quit or reduce smoking. However, this behavior persisted in several individuals who had a prior history of infarction and/or major pulmonary condition. In contrast, others indicated that it took only that one significant event to make them realize what smoking was doing to them. Many of the individuals in this latter group successfully quit smoking "cold turkey" and were proud of it.

As previously stated, the number of subjects who actually did quit or reduced smoking after the onset of either a cardiac or pulmonary event may have been deflated due to the definition of the smoking variables used. (For example, quitting meant smoking no cigarettes during the study period whereas smoking even one cigarette constituted smoking status or relapse.) This study was designed so that the difference in the number of cigarettes smoked on each interview day was what constituted the dependent variable. Had other smoking values been used to calculate the dependent variable (e.g., from past history, or smoking levels rather than difference scores), different results may have occurred. The current smoking status of the subjects was chosen since recent memory is more reliable than historical factors that may have occurred months previously or than recall associated with a traumatic health event.

Disease Perceptions, Advice, Smoking Goals, and Quit Attempts

More than half the sample attributed the cause of their disease to smoking. Yet, as noted in Table 5, more than half the sample was still smoking at time II.

A majority of subjects indicated that they wanted to quit smoking yet some individuals insisted they did not. Reasons cited for refusing to quit include: (1) that smoking was extremely important to these subjects; (2) that their illness was severe and they knew their condition was not going to improve, therefore, they wished to continue something they enjoyed doing (i.e., smoking); and (3) that giving up smoking was like relinquishing control of their lives, therefore, smoking was a way of exhibiting control since it was their decision to do so.

Many of the subjects rated their goals for quitting smoking as high (i.e., most said their goal was to quit smoking completely), but only a little more than half of these same subjects actually were not smoking at time II. Similarly, many subjects predicted their success for quitting as high yet more than half the sample was still smoking at time II.

Little difference between disease groups was noted in the subjects' perceptions about the contribution of smoking to their disease, the desire to quit, the goal for quitting, or the predicted success for quitting. The average number of quit attempts was identical for both disease groups. No difference between cardiac and pulmonary groups appeared in either the type of physician offering advice to quit (e.g., cardiologist, pulmonologist, etc.) or the strength of the advice to quit.

Significant Others

Fewer significant others reported observing subjects smoking during the 24 hour period prior to the first interview (time I) than at time II (Table 7). In comparison, as reported in Table 5, fewer subjects self-reported smoking at time I versus time II. From these results and comments made during interviews, this comparison indicates that the subjects were: (1) truthful with the interviewer, and (2) in some instances, careful not to be seen smoking by others. From both the subject sample and significant other group, more subjects smoked and were seen smoking at time II than at time I. Coincidentally, the percent increase for significant others observing the subjects smoking and the subjects' self-reported smoking from time II than at time I were identical.

Again, more subjects were observed smoking by significant others within the week and month prior to each interview than within the previous 24 hour period (Table 7). Relatively more subjects were observed smoking within the month prior to the first interview than at any other time. This observation may be due to the fact that some subjects, especially cardiac patients, smoked in their normal pattern during that one month period which may have been the month prior to a cardiac event requiring hospitalization (theoretically necessitating smoking cessation). Thus, if interview I occurred either in the hospital or shortly after hospitalization, smoking may have been reduced by then. In addition, many cardiac subjects who may have continued smoking

after their cardiac event may have done so either without the knowledge of their significant others or without being observed by them, thus avoiding negative feedback.

Statistical Analyses

Tests of Significance

Between time I and time II, little difference was observed in the subjects, as determined by comparison of means and paired *t*-tests (Tables 8 and 9). However, a significant difference was found in the frequency of self-regulatory behaviors used by all subjects between time I and time II. This significant difference also held true in the *t*-test for each disease group. Theoretically, the reduction in self-regulatory behaviors may be inversely related to the increase in smoking for the sample at time II, i.e., fewer behaviors to avoid smoking resulted in increased smoking. The decrease in individual efforts to reduce or quit smoking, as noted in the self-reports, over a month's period of time during the course of the study may also correspond to the reduction in use of self-regulatory behaviors from time I to time II.

For the cardiac group, the difference between time I and time II for cigarettes smoked approached significance ($p = .054$) which reflects the increase in smoking between interviews for this group as reported in Table 3. As previously noted, this difference may be due to several factors. First, 10 cardiac subjects were initially interviewed as inpatients in the hospital where smoking is prohibited. Therefore, the quantity smoked, if any, may be deflated resulting in higher relapse or smoking rates at time II. Secondly, cardiac patients may tend to use smoking as a way of coping with the fear and anxiety associated with the uncertainty of prognosis and fate. Consequently, eliminating this coping mechanism only increases their anxiety, epecially when coupled with other required modifications in their behavior. Therefore, many choose not to cease smoking.

Correlations

As can be seen from Table 9, many of the significant corrlelations might be expected, due to intercorrelation effects with other variables in the matrix. Some of the more important significant correlations include the following: high scores on the internal health locus of control scale (IHLC) were likely when high scores were attained on the powerful others health locus of control scale (PHLC) scale; high scores on the health beliefs (HB) scale were likely to occur when high scores were attained either on the powerful others scale or on the health value (HV) scale. Of notable interaction effects observed, those individuals noting frequent use of self-regulatory behaviors (SR) were associated with high scores on both the internal locus of control and health beliefs scales.

Numerous but less notable significant correlations occurred. As previously mentioned, a number of these may have been due to intercorrelation effects. Significant correlations related to the Multidimensional Health Locus of Control Scales are as follows. Interaction effects involving high scores on the internal (IHLC) scale were likely to occur with high scores on the powerful others (PHLC), health value (HV), health beliefs (HB) scales and frequent use of self-regulatory behaviors (SR). High scores on the PHLC scale were likely with high scores on the IHLC, HV, HB scales and use of self-regulatory behaviors in various conformations of interaction effects. Chance health locus of control (CHLC) scores only produced significant associations when forming interaction effects with HV and HB.

High scores on either the HV or HB scales were likely to occur when interactions were formed with each other or with the Multidimensional Health Locus of Control scales (IHLC, PHLC, and CHLC). The use of self-regulatory behaviors only formed significantly correlated interaction effects with health beliefs and not with health value.

As can be determined from Table 9, a number of significant higher order interaction effects resulted involving each of the scales and occasionally with self-

regulatory behaviors. Interpretation of these effects is more difficult but can be summarized as follows: high scores on scales taken together (interaction label, e.g., X_3X_6) were likely to be attained when high scores resulted on the scales associated with another interaction (e.g., X_4X_7). None of the correlations, either for main effects or interaction effects, attained significance with the number of cigarettes smoked at time I.

Post-Hoc Analyses

The regression analysis for the full model failed to support the hypotheses. Non-significance may be due to the fact that a number of subjects were not smoking at time I and remained abstinent at time II. Therefore, compliance for these subjects was 100% but smoking reduction was zero. In theory, then, some of the data was supportive. As a result, additional analyses were attempted.

Post-hoc analyses yielded interesting but non-significant results. When a regression analysis was performed for each individual diagnosis group and a descrepancy was found between these regression values and R^2 for the entire sample, several assumptions followed. First, the sample size was small to begin with. By dividing the subjects into their respective disease groups, the sample size for each disease group was half that of the combined total, lending increased speculation to the validity and significance of the results and their interpretation, especially since the number of variables in the model was high.

Second, since the disease groups were analyzed as homogeneous groups, the intragroup variance may have been significantly reduced to allow for greater predictive value of the independent variables in the respective models. Lastly, as seen in Table 4, the pulmonary group as a whole decreased overall smoking, even though this figure is somewhat small, and of the 8 subjects who did reduce smoking between time I and time II, the majority were from the pulmonary group. Thus, the large percentage of the

variance in the model analysis for the pulmonary subjects accounted for by the independent variables may be attributed to these phenomena as well as those cited above.

Based on the conditions in this study, e.g., different disease states and unrealistic smoking levels at time I, additional analyses were performed. Once again, since the proposed model was not supported, future research could address these issues.

The squared semi-partial correlation coefficients indicate the amount of variance added to R^2 by a particular independent variable after independent variables with higher priority have contributed their share to prediction of the dependent variable (Tabachnick & Fidell, 1989). In this model, these coefficients were very small, indicating that the useful importance of the independent variables was low.

According to Pedhazur (1982), the magnitude of the unstandardized beta weights (regression coefficients, b) may be affected by the units of the scale used to measure a particular variable associated with the beta. A large regression coefficient may result from a scale with a narrow range (Pedhazur uses an example of a scale ranging from 1 to 5) versus variables measured on larger scales as might be seen in standardized tests (e.g., GRE). This theory is appicable to this study since the scales for the Multidimensional Health Locus of Control, Health Value, and Health Belief measures were based on a 7-point Likert scale.

In addition, a large number of regression variables were used in the model. Due to the small sample size resulting in reduced power, support for the model was made more difficult (Tabachnick & Fidell, 1989).

Additional Findings

Smoking-Related Variables

A number of variables based on the subjects' perceptions about their smoking resulted in significant correlations with levels of smoking. These were presented in Table 12 in the section describing Additional Analyses. These relationships indicate that, from this sample, those subjects who wished to quit smoking set a high goal for themselves, i.e., to completely quit smoking, and predicted that they would successfully quit. Interestingly, those individuals who perceived that smoking highly contributed to their disease state also indicated that they wished to quit smoking and that their physicians had advised them to quit. However, correlations with the subjects' goal and predicted success at quitting were not significant.

As might be expected, the importance of smoking to the subjects was positively correlated with the number of cigarettes smoked at both time I and time II. The fact that physicians had advised the subjects to quit and the rating of this advice was also positively related to the importance of smoking to the subjects. Thus, the more important smoking was to the individual: (1) the more likely the subjects were to smoke and smoke more often, (2) the more likely were they to have been advised by their physicians to stop smoking, and (3) the more likely that the advice given was strong.

The more important smoking was to the subjects, the less likely they were to want to quit or to predict success at quitting. The level of smoking was also negatively correlated to several variables. The more the individuals smoked, the less likely they were to want to quit or to set a high goal for themselves for quitting. In addition, they were less likely to predict successful quitting the more they smoked.

SCN Testing

Validity of the compliance variable for smoking using saliva analysis for thiocyanate (SCN), a byproduct of smoking, was begun but not completed due to a lack of effective laboratory procedures and quality control of the samples. Every precaution was taken to preserve the integrity of the samples from the point of collection to freezing and storage. However, control of the transportation temperature and analysis of the samples is a problem that must be recognized as possibly contributing to the erroneous results.

Ideally, the information gathered from the laboratory analysis of the saliva samples would have provided validity of the data in terms of smoking levels. Even without the support of this data, the subjects were quite willing to provide truthful information about their smoking on the days of each interview and at any other time recalled. No difficulty was encountered in obtaining this information from those who completed the study. As indicated by the reports of the significant others, the subjects themselves were more truthful in their self-reports and in the interviews with the investigator than with the significant others. Thus, in this particular study, the usefulness of the SCN tests was theoretically incorporated into the design of the research but, on final analysis, was found not to be necessary, supporting the theories of Jones and Sigall (1971), Pettiti, Friedman and Kahn (1981), and Prochaska and DiClemente (1983).

Anecdotal Responses

Throughout the study, the interviews yielded additional information that is not represented on the questionnaires. Though anecdotal in nature, this information is valuable in relation to current research questions, the subject sample used, and applications to future research. Some of these responses have already been discussed

above. Responses recorded during the subject acquisition and follow-up stages of the research included reasons for volunteering for the study and for refusing to participate.

Reasons for consent to participate in the study were noted as: the good intentions of the subjects (helping the investigator may help someone else in the same situation as they), the investigator reminded them of someone, graduate research empathy, interest in knowing why they act or feel in a certain way, referral for help where the investigator acted as a resource person, or desiring positive feedback from someone else (i.e, another health professional) to validate smoking reduction or quitting. In the majority of cases, these individuals just wanted to be helpful. Regarding hospitalized patients, a major reason for consent may have been to pass the time and being able to talk with someone while undergoing treatment and recuperation. Conversely, however, physical discomfort and depression associated with their conditions often led to patients refusing to be in the study.

Reasons for refusal to participate in the study included: being too ill (which was the response the majority of the time), denial that they were ill therefore not eligible to be in the study, did not wish to discuss their smoking, annoyed that records were retrieved which was interpreted as a breach of confidentiality of patient records, relocation, and a claim by one patient that her eyeglasses broke therefore she could not read the letter or study material. One of the most important reasons for refusal was that the individuals were afraid the investigator would inform their physician and/or family about their smoking or other behaviors. In-person patient contact resulted in observing potential literacy problems not readily apparent during mail or phone contact. Thus, a percentage of non-responses may have been due to the inability of individuals contacted to read and/or understand the material presented to them.

Additional information gathered during the interviews with the subjects was both interesting and pertinent to current theory and practice. As previously mentioned, smoking is prohibited in all local hospitals, yet some of the subjects who were inpatients

at the time of interview admitted to smoking either in the bathroom or in the day room when no one was around. Thus, for some, smoking continued, even though at a reduced rate, when it therapeutically should not have been occurring at all. Also, the subjects seemed less threatened by admitting their smoking levels to the investigator than to their respective significant others. This was reinforced during the second interview after rapport had developed between the subjects and the investigator. Many indicated that they knew their confidential responses would be respected.

The "bogus pipeline phenomenon" (Jones & Sigall, 1971) held in this study in that subjects knew a saliva sample may be requested. Therefore, the accuracy of self-reported smoking seemed high (but unfortunately unverifiable by the saliva tests) in that the subjects indicated that they were telling the investigator the truth since no one would be informed of their responses. However, a number of subjects were hesitant in providing a saliva sample, questioning the use of the sample for something other than nicotine testing, e.g., other drug tests. All subjects were assured that the only test to be performed was for a byproduct of smoking. No one refused to provide a sample when requested.

From the interviews with significant others, those associated with CHD patients seemed to be more inclined to remind subjects and reinforce smoking reduction (or quitting) than those associated with COPD patients. The most interesting result from this group was the number of significant others completely unaware of the subjects' actual smoking levels and the interactions that resulted when the subjects admitted the truth to them.

What might be considered the most devastating results encountered in this study was the denial of the seriousness of one's illness, the contribution smoking has (had) on their illness and, most importantly, the evidence of the relapse or exacerbation of the disease while smoking continued. Almost one-fourth of the original sample (17 out of 71 subjects) experienced disease relapse. Sixteen of the 17 were CHD patients who had

more than one heart attack and were still smoking. It is these individuals who require attention and the focus of future research to help them improve their health and eliminate negative health behaviors.

Conclusions and Educational Implications

From this study, it has been determined that the model proposed was unable to significantly predict smoking reduction in the sample tested. Only 19.39% of the variance in smoking reduction (dependent variable) was accounted for by the independent variables in this model. None of the regression coefficients were significant indicating that none of the independent variables used significantly contributed to the prediction of smoking reduction in the group.

Due to the nature of the sample tested, chronically ill cardiac and pulmonary patients, a number of variables not controlled for by the model may have been major contributors to nonsignificant results and were discussed. The inclusion of subjects based on two different disease states was prompted by a small number of cases of any one diagnosis group at a given point in the patient's condition at a given period of time. Consequently, two disease states significantly affected by cigarette smoking were chosen to facilitate the progress of the study. However, this decision may have affected the results.

The attempt was made to demonstrate the homogeneousness of the sample by presenting the results of both diagnosis groups as well as for the sample as a whole. When reviewing the descriptive results of this study, little differences, if any, were noted between the responses from the cardiac and pulmonary groups. Only one statistical difference was found between the cardiac and pulmonary groups, difference in smoking from time I to time II, which only approached significance. This difference may be due to

the environmental restrictions of hospitalized cardiac patients at time I and the known relapse response of inpatients upon discharge.

Even though these subjects were contacted early on in the development of their disease state, variable results persisted in the individual differences recorded. Some of these differences were explained on the basis of the disease state and location of the subjects at the time of interview. Another limitation appears to be the collection of data at two points in time which may result in confounding the variables due to: (1) a change in the social milieu of the subject from time I to time II, especially if discharged from a hospital; (2) additional stress upon returning to work after a cardiac or pulmonary event particularly if the work environment is conducive to smoking; and (3) especially for the cardiac subjects, the length of time between the illness event and data collected at time II which may induce a change in the perceptions about the disease and smoking.

Attempts to control the variability in this study could be a focus for future research endeavors. Other limitations of this research include small sample size, retaining homogeneous disease groups for analysis, a large number of variables within the proposed regression model, lack of external validity for smoking (due to cancellation of SCN testing), refusal for follow-up, and possible confounding of the results due to illness behavior (e.g., denial, exacerbation of disease, loss of control, etc.). Thus, future research could also address the issues of social support, other personality factors and coping mechanisms, and the availability of alternative methods for quitting. This last issue is especially amenable to educational implications.

The fact that this research was based solely upon an illness population sets it apart for a number of reasons: (1) it deals with subjects who are living with a chronic and potentially life-threatening illness which presents a multitude of problems with research design and data collection, (2) patient behaviors, beliefs and attitudes were tested as the subjects were experiencing them and not as if these principles were hypothetical, (3) student populations were not tested to support the hypotheses, as is

done in many studies regarding health-related constructs. As a result, the model was not supported but a number of results proved interesting based on the sample tested.

The chronically ill exhibit many characteristics. Tapping each of these is an insurmountable task. However, a number of interesting characteristics were described. This would not have been possible had a healthy population been used. Furthermore, since two different disease groups were used in this study, results were available not only for a group of chronically ill individuals but information was provided about the smoking behaviors and perceptions of two major patient groups with diseases representing major mortality figures in the U.S.

As was noted in the review of the literature, coronary and pulmonary disease not only are major causes of death in this country, but are known to be directly linked to cigarette smoking. Therefore, the following questions arose: Why are these patients still smoking? and Is illness enough to deter inappropriate behavior (such as smoking) or should there be an educational process involved? Further investigation led to the incorporation of the health-related constructs of locus of control, values, beliefs, and self-regulation.

The issue of patient compliance, as researched in this study, was found to be existent for some subjects and nonexistent for others. The model, which tested the prediction of compliance with reduction in smoking by cardiopulmonary patients, was not supported. However, the data showed that certain subjects successfully reduced or ceased smoking after an illness event. Even though compliance did occur, the model alone could not predict this success. Thus, future studies may require additional or larger models in order to determine the appropriate predictor variables.

The rationale for this research still holds: development of patient education based on individual differences related to patient attitudes and behaviors. Future research should attempt to modify the proposed model, control for variables presented in

this research, and develop patient educational programs to aid the chronically ill to cease smoking to maintain health.

APPENDIX A

Sample Letter and Consent Form for COPD Subjects

Dear ,

Recently, you received a lung function test at Long Island Jewish Medical Center. I am conducting a study for my Ph.D. degree of individuals such as yourself in affiliation with the hospital. I would like you to participate in this project for the purposes of learning from your experiences and developing patient education materials.

The study involves determining the health beliefs of individuals who have experienced some type of heart or lung problem, or symptoms of this nature, and who are/were smokers. It involves questionnaires to be answered by yourself as well as a short form to be completed by someone close to you. There are no "right" answers to these questions, only simple recollections or opinions. Participation in this project will require answering two sets of questionnaires over a period of approximately one month. Please be assured this study involves no medications or medical treatment of any kind, only questionnaires.

It is essential for me to gather information from individuals who may have visited their physician recently and who either are smokers or who have recently quit smoking. I need your help so that the results of my research might help others in similar situations. Even if you no longer smoke, your insights and opinions are important to me.

Participation in this project is voluntary, at no cost to you, and completely confidential. No one will be informed of your responses. A consent form required of all individuals who volunteer to participate in hospital-affiliated projects is attached. After reading it, the consent form should be signed and dated at the checked (√) areas and returned to me as soon as possible. Also, please include your phone number and any corrections or change of address at the bottom of the form. For your convenience, a stamped, addressed envelope is enclosed. Upon receiving the signed form, I will contact you about completing the initial questionnaires.

Won't you please help me help others? Your participation in this project is vital to its success and will contribute to the health of others in the future. As a token of my appreciation, you will receive a gift for participating in this study at its conclusion. If you should have any questions, I may be contacted in the evenings at (718) or you may leave a message and I will return your call. I will be looking forward to receiving your reply. Thank you.

Sincerely,

Virginia J. Galizia, M.S., R.Ph.

enc.

LONG ISLAND JEWISH MEDICAL CENTER

Consent Form for New Procedure, Study or Drug under Clinical Investigation

Investigator(s) or Project Director: Harry Steinberg, MD and Virginia J. Galizia, RPh, PhD Candidate

Title of Protocol: A test of a compliance model for prediction of smoking behavior in cardiac and pulmonary patients.

Duration of Subject's Participation: 1 to 2 months

I agree to have _____ (name) participate in the following project: Smokers with heart or lung symptoms will complete questionnaires concerning health beliefs and behaviors to determine if these have a relationship with smoking reduction. A verbal report about smoking habits will be taken from the participant and significant other.

I understand that the project will include the following experimental procedures: Completing questionnaires, verbal interviews and reports about smoking activities, and laboratory analysis of saliva. [No experimental intervention, counseling, or drugs will be used.]

I understand that the possible discomforts or risks may be as follows: A saliva sample for laboratory analysis.

I also understand that the possible and desired benefits of participation in this study are: Development of patient education for cardiopulmonary patients who smoke to reduce the possibility of further disease unless they quit smoking.

I am aware that the following alternative procedures could be of benefit: Psychological counseling.

4/85

In the case of physical injury resulting from my participation in the study, only immediate, essential, short-term treatment as detemined by the doctors will be made available without charge to me. There will be no monetary compensation or non-emergency care provided by the Long Island Jewish Medical Center.

I have been given the opportunity to ask further questions and know that I may do so during the course of the project. I understand that in comparison to the costs of medical care which I would normally bear, my participation in this study may: a)greatly increase; b)increase; (c)have no effect; d)decrease; e)greatly decrease my cost (Note: The researcher must circle one of the preceding choices)

I am aware that I am under no obligation to participate in this project. I am also aware that I may withdraw my participation at any time without prejudice to my medical treatment at the Long Island Jewish Medical Center.

My identity and participation will be kept confidential to the extent permitted by law, althouth I understand that if investigational drugs and/or medical devices subject to U.S. Food and Drug Administration regulations are involved, if may be necessary for this consent form and other medical records to be reviewed by representatives of the F.D.A.

I further understand that should I have any questions about my treatment or any other matter relative to participation in this project, I may call the Research Grants Management Office at (718) 470-8645, and I will be given the opportunity to discuss, in confidence, any questions with a member of the Institutional Review Board for the Protection of Human Subjects. As required by Federal Regulations and State Law, this is an independent Committee composed of physicians, administrative staff and lay members of the community not affiliated with this institution. This Committee has evaluated the potential risks and possible benefits of the study.

I also understand that I will be told of any new findings that my influence my willingness to continue my participation in this research project.

A copy of this consent form has been offered to me.

✓ Please print
Subject's Name_____

✓ Signature ~~(if the subject is 9 years or older)~~_____ Date_____

Parent/Guardian's Name_____/Signature_____Date_____

✓ Witness:(print)_____/Signature_____

✓ Relationship of Witness to Subject_____

If the assent of the child, aged 9 or older is not obtained, state reason:

✓ Phone number: (_____)_____

Change of address/corrections:

APPENDIX B

Sample Letter and Consent Form for Cardiac (Rehabilitation) Subjects

Dear ,

I am conducting a study for my Ph.D. degree of individuals such as yourself in affiliation with the Richmond Cardio-Pulmonary Care Center. I would like you to participate in this project for the purposes of learning from your experiences and developing patient education materials. This research project is being conducted with the approval of Dr. Bloomfield, the Center's Medical Director, and its Administrative Director, Julie Weissglass Cohen.

The study involves determining the health beliefs of individuals who have experienced some type of heart or lung problem, or symptoms of this nature. It consists of questionnaires to be answered by yourself as well as a short form to be completed by someone close to you. There are no "right" answers to these questions, only simple recollections or opinions, and brief questions concerning related medical history. The study will take place over a period of approximately two months during which two sets of questionnaires will be administered. Please be assured this study involves no medications or medical treatment of any kind, only questionnaires.

Participation in this project is voluntary, at no cost to you, and completely confidential. No one will be informed of your responses. A consent form for volunteering to participate in this research project is attached. After reading it, the consent form should be signed, dated, and returned to me as soon as possible. Also, please include any corrections or change of address at the bottom of the form. For your convenience, a stamped, addressed envelope is enclosed. Upon receiving the signed form, I will send you the initial questionnaires with further instructions.

If you should have any questions, I may be contacted in the evenings at (718) or you may leave a message and I will return your call. Mrs. Cohen will be happy to verify the information contained in this letter and may be contacted at the Center. Won't you please help me help others? Your participation in this project is vital to its success and will contribute to the health of others in the future. I will be looking forward to receiving your reply. Thank you.

Sincerely,

Virginia J. Gallzia, M.S., R.Ph.

enc.

Consent Form for Clients of Richmond Cardio-Pulmonary Care, P.C.

I understand that participation in this research project involves answering questions on beliefs about health and related past medical history, including smoking behavior. I am aware that this project will involve completing questionnaires and verbal interviews, and may involve a saliva sample for laboratory analysis.

I understand that no experimental intervention, counseling, treatment, or drugs will be involved. I am aware that I am under no obligation to participate in this study and that I may withdraw at any time. My participation in this study is voluntary and without compensation or cost to me.

I understand that my identity and participation will be kept confidential; that any information given or conversations between myself and the researcher will remain confidential. I also understand that the possible benefit of participation in this study is the development of patient education materials for cardiopulmonary patients to improve compliance and health.

I have read this consent form and agree to participate in this study.

Signature _____

Date _____

APPENDIX C

Sample Questionnaire - COPD (MHLC Form A)

1.

Smoking History Questionnaire and Interview (P-C) #_____ Date _____

1. Age (Date of birth): _____

2. Sex: ___M ___F

3. Check the category which best describes your educational background:

   a. ___ professional or graduate degree
   b. ___ 4 year college graduate
   c. ___ 1 to 3 years of college
   d. ___ high school graduate
   e. ___ 10 to 11 years of school
   f. ___ 7 to 9 years of school
   g. ___ less than 7 years of school

4. At what age did you begin to smoke? _____

5. In a typical day, how many cigarettes do you smoke?

   a. ___ less than 10
   b. ___ from 10 to19
   c. ___ from 20 to 39
   d. ___ more than 40: approximate #_____

6. Throughout your years of smoking, what is the total number of times you attempted to quit smoking?

   a. ___ never
   b. ___ one time
   c. ___ 2 to 4 times
   d. ___ 5 to 7 times
   e. ___ 7 to 9 times
   f. ___ 10 times or more

   When were these attempts made? (Please indicate how many months or years ago, or give the dates if you remember.)

7. What type(s) of cigarettes do you smoke?

   a. ___ unfiltered cigarettes
   b. ___ filtered cigarettes
   c. ___ filtered, low tar, low nicotine cigarettes

8. Check if you smoke the following:

   a. ___ cigars
   b. ___ pipe

9. When you smoke, do you inhale or puff the cigarette?

   a. ___ inhale
   b. ___ puff

10. Did you smoke up until this clinic referral?

   a. ___ yes (Go on to number 11.)
   b. ___ no (Please answer the following questions.)

   How long has it been since you quit smoking?

   a. ___ more than 6 months: how long?_____
   b. ___ less than 6 months: how long?_____

   How did you accomplish this?

11. In relation to your smoking, which of the following symptoms have you experienced? (Check all that apply.)

	Frequently	Occasionally	Not at all
throat irritation			
coughing and gagging			
eye irritation			
sinus congestion			
rapid heartbeat			
chest pain			
shortness of breath			
headache			
trembling hand			
inability to sleep			
nervousness			
irritability			
change in blood pressure			
phlegm, mucus			

12. Do you believe smoking contributed to your lung condition? (Circle number) 3.

7	6	5	4	3	2	1
smoking definitely caused my lung. condition		smoking had a great deal to do with it		smoking had very little to do with it		smoking had nothing to do with it

13. Have you been instructed by your doctor to stop smoking?

a. ___ yes (Please answer the following question.)
b. ___ no

If yes, please rate the advice given you by your doctor to quit smoking: (Circle number)

7	6	5	4	3	2	1
of utmost importance		strongly emphasized		weakly emphasized		casually mentioned

14. Do you want to quit smoking?

a. ___ yes (Please answer the following questions.)
b. ___ no

If yes, what is your goal? (Circle number)

4	3	2	1
to totally quit smoking	to quit for awhile	to cut down on smoking	to go back to how I smoked before

If yes, please indicate how successful you think you will be in quitting: (Circle number)

5	4	3	2	1
I am going to quit smoking altogether	I will probably quit for a few weeks	I will probably cut down on the number of cigarettes I smoke a day	I will probably go back to smoking as usual (the same # of cigarettes a day I smoked before)	I cannot quit smoking

15. How important is smoking to you? (Circle number)

7	6	5	4	3	2	1
very important		pleasurable		just a habit		not at all important

4.

Questionnaire A-1-2 # _____

Date _____

This is a questionnaire designed to determine the way in which different people view certain important health-related issues. Each item is a belief statement with which you may agree, disagree, or relate to according to the responses provided. Below each statement is a scale which ranges from 1 to 7. For each item, we would like you to CIRCLE THE NUMBER that represents the extent to which you relate to the statement. Please make sure that you answer every item and that you circle only one number per item. This is a measure of your personal beliefs, therefore, there are no right or wrong answers.

Please answer these items carefully but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe.

Thank you.

A-1-2 #_____ 5.

1. If I get sick, it is my own behavior which determines how soon I get well again.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

2. No matter what I do, if I am going to get sick, I will get sick.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

3. Having regular contact with my physician is the best way for me to avoid illness.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

4. Most things that affect my health happen to me by accident.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

5. Whenever I don't feel well, I should consult a medically trained professional.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

6. I am in control of my health.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

6.

7. My family has a lot to do with my becoming sick or staying healthy.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

8. When I get sick I am to blame.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

9. Luck plays a big part in determining how soon I will recover from an illness.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

10. Health professionals control my health.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

11. My good health is largely a matter of good fortune.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

12. The main thing which affects my health is what I myself do.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

7.

13. If I take care of myself, I can avoid illness.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

14. When I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

15. No matter what I do, I'm likely to get sick.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

16. If it's meant to be, I will stay healthy.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

17. If I take the right actions, I can stay healthy.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

18. Regarding my health, I can only do what my doctor tells me to do.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

8.

19. In general, do you consider the risks of smoking for your long-term health to be serious?

7	6	5	4	3	2	1
very serious		moderately serious		not very serious		not at all serious

20. In general, do you consider the effect of smoking upon your health to be serious?

7	6	5	4	3	2	1
very serious		moderately serious		not very serious		not at all serious

21. How much of an effect do you feel that stopping smoking now will have in reducing the risk to health over the rest of your life?

7	6	5	4	3	2	1
a great deal		a moderate amount		just a little		not at all

22. Does your smoking interfere with your eating or sleeping?

7	6	5	4	3	2	1
a great deal		a moderate amount		just a little		not at all

23. We live in a time when there is more danger from disease and accidents than ever before.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

24. If I got sick it would be very bad for my family.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

9.

25. In general, how much do you worry about your health?

7	6	5	4	3	2	1
a great deal		a moderate amount		just a little		not at all

26. In general, how closely do you tend to follow a clinician's advice?

7	6	5	4	3	2	1
very closely		moderately closely		not very closely		not at all closely

27. I try to do exactly what the doctor tells me to do without questions.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

28. You have to use your own judgment in deciding how much of the doctor's advice to follow.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

29. Whenever I read or hear about some disease, I think I may get it.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

30. In general, how much trouble have you had with the initial phase of cutting down or stopping smoking?

7	6	5	4	3	2	1
a great deal of trouble		a moderate amount of trouble		just a little trouble		no trouble at all

10.

31. If you don't have your health you don't have anything.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

32. There are many things I care about more than my health.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

33. Good health is of only minor importance in a happy life.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

34. There is nothing more important than good health.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

Self-Report (A-1-2) 11.

Date_____ #_____

1. What was your goal for today?

   a) to smoke when I felt like it
   b) to cut down on the number of cigarettes I smoked today
   c) not to smoke at all

2. Did you have the urge to smoke today? ____Yes ____No

3. Please note your thoughts/feelings and your locations during the times when you felt these urges and if you smoked each time:

Time (AM/PM)	Smoked? (Yes/No)	Location	Thoughts/Feelings

4. How many cigarettes did you smoke today? _____

   Indicate place and (approximate) time when smoking:

5. Did anyone see you smoking? ____Yes ____No

   If yes, who?

   If yes, what were their reactions? (e.g., walked away, said nothing, scolded you, etc.)

6. Please answer the following question by checking all that apply and indicating the number of times each occurred today:

I was able to avoid smoking today by:

(1)___taking a walk
(2)___going to sleep
(3)___reading a book or magazine
(4)___watching TV
(5)___listening to the radio
(6)___talking myself out of smoking
(7)___talking to another patient
(8)___talking to a family member/visitor
(9)___talking to a hospital staff member
(10)___making a phone call
(11)___drinking/eating something
(12)___chewing gum/mints
(13)___writing a letter/note
(14)___drawing/doodling/painting
(15)___sewing/knitting
(16)___working with my hands
(17)___rewarding myself for not smoking
(18)___avoiding things associated with smoking
(19)___getting encouragement from others (who?_____)
(20)___using self-help materials (e.g., book, tape)
(21)___using drugs, medications, alcohol
(22)___mental imaging
(23)___meditation
(24)___relaxation technique (please describe below)

(25)___other (please describe below)

7. In general, how do you feel today?

Physically: a) very good
b) good
c) fair
d) uncomfortable

Emotionally: a) very good
b) good
c) fair
d) uncomfortable

13.

8. Please read each statement (parts 8a. and 8b.) before completing this question:

8a. What efforts have you made in the past to quit smoking or reduce the number of cigarettes you smoke? Did anyone help you? (Please identify or explain relationship.)

8b. What efforts have you made in the last month to quit smoking or reduce the number of cigarettes you smoke? Did anyone help you? (Please identify or explain relationship.)

9. In your estimation, what factors do you attribute to being able to quit, reduce smoking, or not being able to do either?

14.

Report from Significant Other (B-1-2) #_____

Date_____ Relationship_____

1. Has the patient been observed smoking today? ___Yes ___No

   In the last week? ___Yes ___No

   In the last month? ___Yes ___No

   If yes, how many times? Today? ____

   In the past week? ____

   In the past month? ____

2. Do you encourage the patient to quit or reduce smoking? ___Yes ___No

   Type of encouragement? (check if applicable) ___ praise ___ rewards
   ___ reminders ___ distraction

   How often?

3. Has support, encouragement, or guidance to quit smoking come from anyone else (e.g., smoking group, nurse, physician, etc.)? If yes, please identify.

4. Do you smoke? ___Yes ___No

   If yes, is the patient aware of your smoking? ___Yes ___No

Thank you.

APPENDIX D

Sample Questionnaire - CHD (MHLC Form B)

1.

Smoking History Questionnaire and Interview (C-H) #_____ Date _____

1. Age (Date of birth): _____

2. Sex: ___M ___F

3. Check the category which best describes your educational background:

   a. ___ professional or graduate degree
   b. ___ 4 year college graduate
   c. ___ 1 to 3 years of college
   d. ___ high school graduate
   e. ___ 10 to 11 years of school
   f. ___ 7 to 9 years of school
   g. ___ less than 7 years of school

4. At what age did you begin to smoke? _____

5. In a typical day, how many cigarettes do you smoke?

   a. ___ less than 10
   b. ___ from 10 to19
   c. ___ from 20 to 39
   d. ___ more than 40: approximate #_____

6. Throughout your years of smoking, what is the total number of times you attempted to quit smoking?

   a. ___ never
   b. ___ one time
   c. ___ 2 to 4 times
   d. ___ 5 to 7 times
   e. ___ 7 to 9 times
   f. ___ 10 times or more

   When were these attempts made? (Please indicate how many months or years ago, or give the dates if you remember.)

7. What type(s) of cigarettes do you smoke?

   a. ___ unfiltered cigarettes
   b. ___ filtered cigarettes
   c. ___ filtered, low tar, low nicotine cigarettes

8. Check if you smoke the following:

   a. ___ cigars
   b. ___ pipe

9. When you smoke, do you inhale or puff the cigarette?

   a. ___ inhale
   b. ___ puff

10. Did you smoke up until this hospital admission?

   a. ___ yes (Go on to number 11.)
   b. ___ no (Please answer the following questions.)

   How long has it been since you quit smoking?

   a. ___ more than 6 months: how long?_____
   b. ___ less than 6 months: how long?_____

   How did you accomplish this?

11. In relation to your smoking, which of the following symptoms have you experienced? (Check all that apply.)

	Frequently	Occasionally	Not at all
throat irritation			
coughing and gagging			
eye irritation			
sinus congestion			
rapid heartbeat			
chest pain			
shortness of breath			
headache			
trembling hand			
inability to sleep			
nervousness			
irritability			
change in blood pressure			
phlegm, mucus			

3.

12. Do you believe smoking contributed to your heart condition? (Circle number)

7	6	5	4	3	2	1
smoking definitely caused my heart condition		smoking had a great deal to do with it		smoking had very little to do with it		smoking had nothing to do with it

13. Have you been instructed by your doctor to stop smoking?

a. ___ yes (Please answer the following question.)
b. ___ no

If yes, please rate the advice given you by your doctor to quit smoking: (Circle number)

7	6	5	4	3	2	1
of utmost importance		strongly emphasized		weakly emphasized		casually mentioned

14. Do you want to quit smoking?

a. ___ yes (Please answer the following questions.)
b. ___ no

If yes, what is your goal? (Circle number)

4	3	2	1
to totally quit smoking	to quit for awhile	to cut down on smoking	to go back to how I smoked before

If yes, please indicate how successful you think you will be in quitting: (Circle number)

5	4	3	2	1
I am going to quit smoking altogether	I will probably quit for a few weeks	I will probably cut down on the number of cigarettes I smoke a day	I will probably go back to smoking as usual (the same # of cigarettes a day I smoked before)	I cannot quit smoking

15. How important is smoking to you? (Circle number)

7	6	5	4	3	2	1
very important		pleasurable		just a habit		not at all important

4.

Questionnaire B-1-2 # _____

Date _____

This is a questionnaire designed to determine the way in which different people view certain important health-related issues. Each item is a belief statement with which you may agree, disagree, or relate to according to the responses provided. Below each statement is a scale which ranges from 1 to 7. For each item, we would like you to CIRCLE THE NUMBER that represents the extent to which you relate to the statement. Please make sure that you answer every item and that you circle only one number per item. This is a measure of your personal beliefs, therefore, there are no right or wrong answers.

Please answer these items carefully but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe.

Thank you.

B-1-2 # _____ 5.

1. If I become sick, I have the power to make myself well again.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

2. Often I feel that no matter what I do, if I am going to get sick, I will get sick.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

3. If I see an excellent doctor regularly, I am less likely to have health problems.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

4. It seems that my health is greatly influenced by accidental happenings.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

5. I can only maintain my health by consulting health professionals.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

6. I am directly responsible for my health.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

6.

7. Other people play a big part in whether I stay healthy or become sick.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

8. Whatever goes wrong with my health is my own fault.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

9. When I am sick, I just have to let nature run its course.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

10. Health professionals keep me healthy.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

11. When I stay healthy, I'm just plain lucky.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

12. My physical well-being depends on how well I take care of myself.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

7.

13. When I feel ill, I know it is because I have not been taking care of myself properly.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

14. The type of care I receive from other people is what is responsible for how well I recover from an illnesss.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

15. Even when I take care of myself, it's easy to get sick.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

16. When I become ill, it's a matter of fate.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

17. I can pretty much stay healthy by taking good care of myself.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

18. Following doctor's orders to the letter is the best way for me to stay healthy.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

8.

19. In general, do you consider the risks of smoking for your long-term health to be serious?

7	6	5	4	3	2	1
very serious		moderately serious		not very serious		not at all serious

20. In general, do you consider the effect of smoking upon your health to be serious?

7	6	5	4	3	2	1
very serious		moderately serious		not very serious		not at all serious

21. How much of an effect do you feel that stopping smoking now will have in reducing the risk to health over the rest of your life?

7	6	5	4	3	2	1
a great deal		a moderate amount		just a little		not at all

22. Does your smoking interfere with your eating or sleeping?

7	6	5	4	3	2	1
a great deal		a moderate amount		just a little		not at all

23. We live in a time when there is more danger from disease and accidents than ever before.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

24. If I got sick it would be very bad for my family.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

9.

25. In general, how much do you worry about your health?

7	6	5	4	3	2	1
a great deal		a moderate amount		just a little		not at all

26. In general, how closely do you tend to follow a clinician's advice?

7	6	5	4	3	2	1
very closely		moderately closely		not very closely		not at all closely

27. I try to do exactly what the doctor tells me to do without questions.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

28. You have to use your own judgment in deciding how much of the doctor's advice to follow.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

29. Whenever I read or hear about some disease, I think I may get it.

7	6	5	4	3	2	1
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

30. In general, how much trouble have you had with the initial phase of cutting down or stopping smoking?

7	6	5	4	3	2	1
a great deal of trouble		a moderate amount of trouble		just a little trouble		no trouble at all

10.

31. If you don't have your health you don't have anything.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

32. There are many things I care about more than my health.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

33. Good health is of only minor importance in a happy life.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

34. There is nothing more important than good health.

7	6	5	4	3	2	1
strongly agree		moderately agree		moderately disagree		strongly disagree

Self-Report (A-1-2) 11.

Date_____ #_____

1. What was your goal for today?

   a) to smoke when I felt like it
   b) to cut down on the number of cigarettes I smoked today
   c) not to smoke at all

2. Did you have the urge to smoke today? ____Yes ____No

3. Please note your thoughts/feelings and your locations during the times when you felt these urges and if you smoked each time:

Time (AM/PM)	Smoked? (Yes/No)	Location	Thoughts/Feelings

4. How many cigarettes did you smoke today? _____

   Indicate place and (approximate) time when smoking:

5. Did anyone see you smoking? ____Yes ____No

   If yes, who?

   If yes, what were their reactions? (e.g., walked away, said nothing, scolded you, etc.)

12.

6. Please answer the following question by checking all that apply and indicating the number of times each occurred today:

I was able to avoid smoking today by:

(1)___taking a walk
(2)___going to sleep
(3)___reading a book or magazine
(4)___watching TV
(5)___listening to the radio
(6)___talking myself out of smoking
(7)___talking to another patient
(8)___talking to a family member/visitor
(9)___talking to a hospital staff member
(10)___making a phone call
(11)___drinking/eating something
(12)___chewing gum/mints
(13)___writing a letter/note
(14)___drawing/doodling/painting
(15)___sewing/knitting
(16)___working with my hands
(17)___rewarding myself for not smoking
(18)___avoiding things associated with smoking
(19)___getting encouragement from others (who?_____)
(20)___using self-help materials (e.g., book, tape)
(21)___using drugs, medications, alcohol
(22)___mental imaging
(23)___meditation
(24)___relaxation technique (please describe below)

(25)___other (please describe below)

7. In general, how do you feel today?

Physically:
a) very good
b) good
c) fair
d) uncomfortable

Emotionally:
a) very good
b) good
c) fair
d) uncomfortable

13.

8. Please read each statement (parts 8a. and 8b.) before completing this question:

8a. What efforts have you made in the past to quit smoking or reduce the number of cigarettes you smoke? Did anyone help you? (Please identify or explain relationship.)

8b. What efforts have you made in the last month to quit smoking or reduce the number of cigarettes you smoke? Did anyone help you? (Please identify or explain relationship.)

9. In your estimation, what factors do you attribute to being able to quit, reduce smoking, or not being able to do either?

14.

Report from Significant Other (B-1-2) #_____

Date_____ Relationship_____

1. Has the patient been observed smoking today? ___Yes ___No

   In the last week? ___Yes ___No

   In the last month? ___Yes ___No

   If yes, how many times? Today? ____

   In the past week? ____

   In the past month? ____

2. Do you encourage the patient to quit or reduce smoking? ___Yes ___No

   Type of encouragement? (check if applicable) ___ praise ___ rewards
   ___ reminders ___ distraction

   How often?

3. Has support, encouragement, or guidance to quit smoking come from anyone else (e.g., smoking group, nurse, physician, etc.)? If yes, please identify.

4. Do you smoke? ___Yes ___No

   If yes, is the patient aware of your smoking? ___Yes ___No

Thank you.

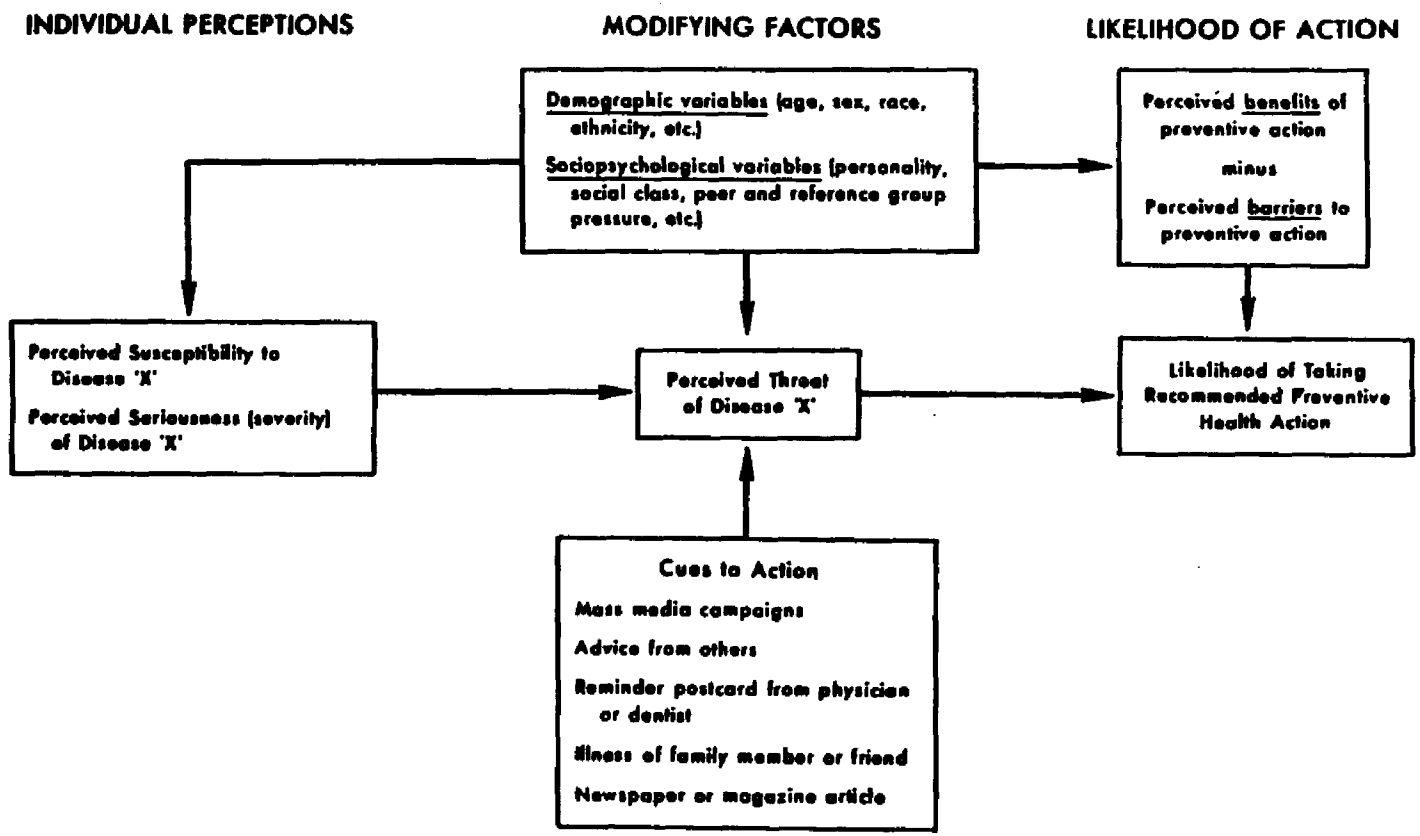

Figure 1. Original formulation of the Health Belief Model

From "Historical Origins of the Health Belief Model" by I. M. Rosenstock (p. 7) in The Health Belief Model and Personal Health Behavior, M. H. Becker (Ed.), 1974, Thorofare, NJ: Charles B. Slack, Inc. Copyright 1974 by Charles B. Slack, Inc. Reprinted by permission.

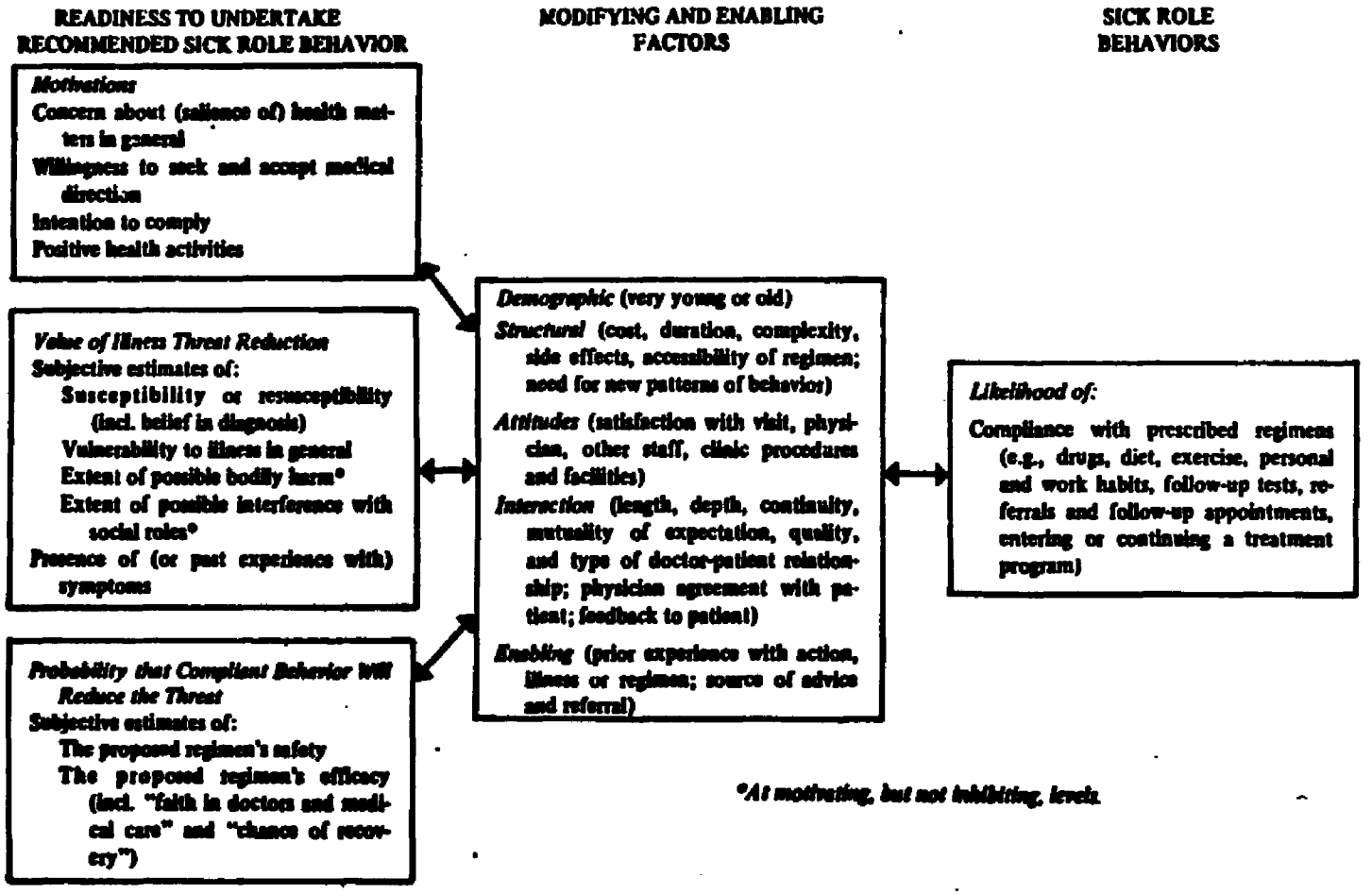

Figure 2. Summary Health Belief Model for Predicting and Explaining Sick Role Behaviors

From "The Health Belief Model and Sick Role Behavior" by M. H. Becker (p. 89) in The Health Belief Model and Personal Health Behavior, M. H. Becker (Ed.), 1974, Thorofare, NJ: Charles B. Slack, Inc. Copyright 1974 by Charles B. Slack, Inc. Reprinted by permission.

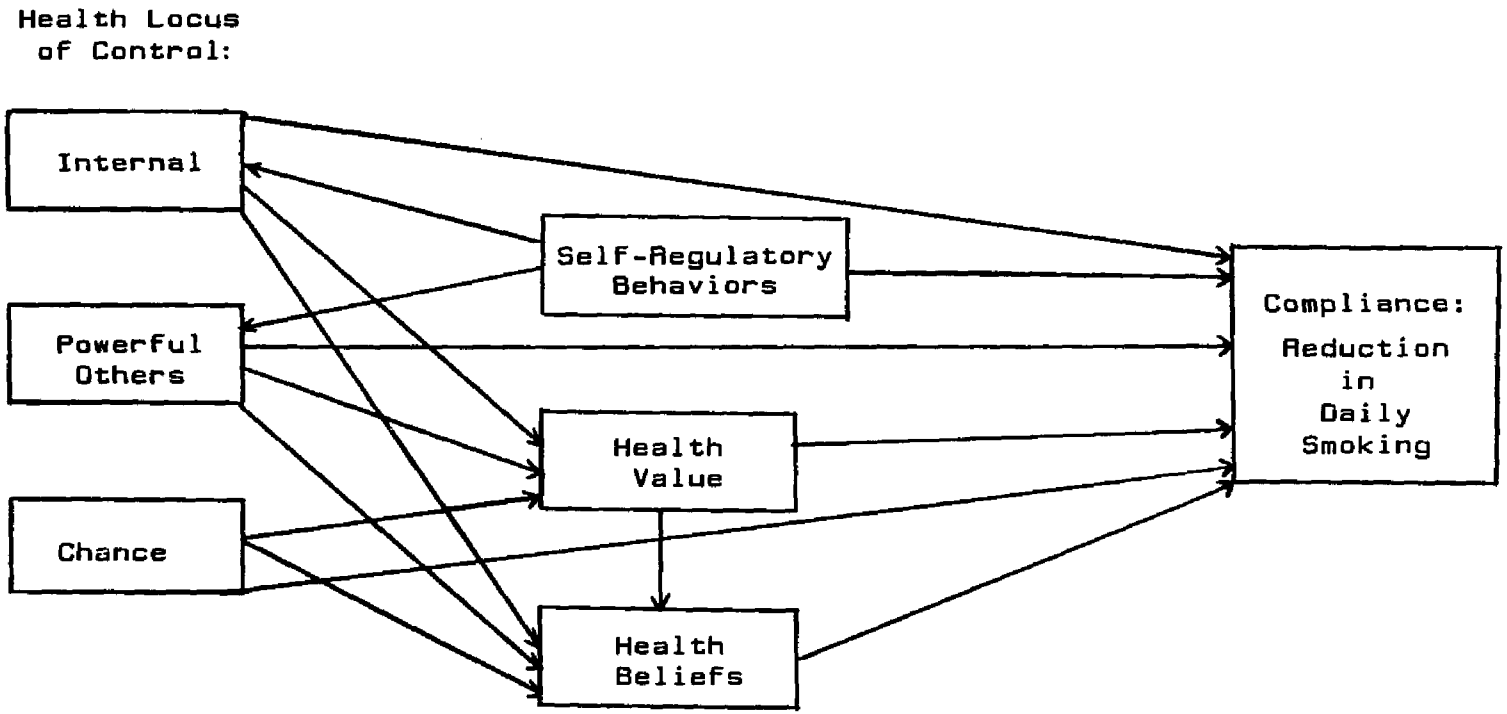

Figure 3. Proposed Compliance Model

REFERENCES

Abramson, L. Y., Seligman, M. E. P. & Teasdale, J. D. (1978). Learned helplessness in humans: Critique and reformulation. Journal of Abnormal Psychology, 87(1): 49-74.

Baer, P. E., Foreyt, J. P. & Wright, S. (1977). Self-directed termination of excessive cigarette use among untreated smokers. Journal of Behavior Therapy and Experimental Psychiatry, 8: 71-74.

Bailey, W. C., Brooks, C. M., Goetter, W. E., Manzella, B. A., Martin, B., Richards, J. M., Soong, S. J., Stewart, L. & Windsor, R. A. (1987, August). Assessment and promotion of self-management in adults with asthma. Paper presented at the meeting of the American Psychological Association, New York City.

Baker, T. R., Oscherwitz, M., Corlin, R., Jarboe, T., Telsch, J. & Nichaman, M. Z. (1970). Screening and treatment program for mild chronic obstructive pulmonary disease. Journal of the American Medical Association, 214: 1448-1455.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84: 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37: 122-147.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Becker, M. H. (Ed.). (1974). The Health Belief Model and personal health behavior. Health Education Monographs, 2: 326-473.

Becker, M. H., Maiman, L. A., Kirscht, J. P., Haefner, D. P., Drachman, R. H. & Taylor, D. W. (1979). Patient perceptions and compliance: Recent studies of the Health Belief Model. In R. B. Haynes, D. W. Taylor & D. L. Sackett (Eds.), Compliance in health care (pp. 78-109). Baltimore, MD: The Johns Hopkins University Press.

Benfari, R. C. & Eaker, E. (1984). Cigarette smoking outcomes at four years of follow-up, psychological factors, and reactions to group intervention. Journal of Clinical Psychology, 40: 1089-1097.

Best, J. A. (1975). Tailoring smoking withdrawal procedures to personality and motivational differences. Journal of Consulting and Clinical Psychology, 43: 1-8.

Best, J. A. & Steffy, R. A. (1975). Smoking modification procedures for internal and external locus of control clients. Canadian Journal of Behavioral Sciences, 7: 155-165.

Burling, T. A., Singleton, E. G., Bigelow, G. E., Baile, W. F. & Gottlieb, S. H. (1984). Smoking following myocardial infarction: A critical review of the literature. Health Psychology, 3: 83-96.

Buss, A. H. & Finn, S. E. (1987). Classification of personality traits. Journal of Personality and Social Psychology, 52: 432-444.

Carver, C. S. & Scheier, M. F. (1981). Attention and self-regulation: A control theory approach to human behavior. NY: Springer-Verlag.

Carver, C. S. & Scheier, M. F. (1982). An information processing perspective on self-management. In P. Karoly & F. H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 93-128). NY: Pergamon Press.

Castro, F. G., Newcomb, M. D., McCreary, C. & Baezconde-Garbanati, L. (1989). Cigarette smokers do more than just smoke cigarettes. Health Psychology, 8: 107-129.

Chambliss, C. & Murray, E. J. (1979a). Cognitive procedures for smoking reduction: Symptom attribution versus efficacy attribution. Cognitive Therapy and Research, 3: 91-95.

Chambliss, C. & Murray, E. J. (1979b). Efficacy attribution, locus of control, and weight loss. Cognitive Therapy and Research, 3: 349-353.

Cluss, P. A. & Epstein, L. H. (1985). The measurement of medical compliance in the treatment of disease. In P. Karoly (Ed.), Measurement strategies in health psychology (pp. 403-432). NY: John Wiley & Sons.

Coan, R. W. (1973). Personality variables associated with cigarette smoking. Journal of Personality and Social Psychology, 26: 86-104.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Copeland, A. P. (1982). Individual difference factors in children's self-management: Toward individualized treatments. In P. Karoly & F. H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 207-239). NY: Pergamon Press.

Davis, M. S. (1967). Predicting non-compliant behavior. Journal of Health and Social Behavior, 8: 265-271.

Dawber, T. R. (1980). The Framingham Study: The epidemiology of atherosclerotic disease. Cambridge, MA: Harvard University Press.

Doll, R. & Hill, A. B. (1964). Mortality in relation to smoking: Ten years' observations of British doctors. British Medical Journal, 1: 1399-1410.

Doll, R. & Peto, R. (1976). Mortality in relation to smoking: 20 years' observations on male British doctors. British Medical Journal, 2: 1525-1536.

Doyle, J. T., Dawber, T. R., Kannel, W. B., Heslin, A. S. & Kahn, H. A. (1962). Cigarette smoking and coronary heart disease: Combined experience of the Albany and Framingham studies. New England Journal of Medicine, 266: 796-801.

Doyle, J. T., Dawber, T. R., Kannel, W. B., Kinch, S. H. & Kahn, H. A. (1964). The relationship of cigarette smoking to coronary heart disease. Journal of the American Medical Association, 190: 886-890.

Dweck, C. S. (1975). The role of expectations and attributions in the alleviation of learned helplessness. Journal of Personality and Social Psychology, 32(4): 674-685.

Foxman, B., Sloss, E. M., Lohr, K. N. & Brook, R. H. (1986). Chronic bronchitis: Prevalence, smoking habits, impact, and antismoking advice. Preventive Medicine, 15: 624-631.

Giannetti, V. J., Reynolds, J. & Rihn, T. (1985). Factors which differentiate smokers from ex-smokers among cardiovascular patients: A discriminant analysis. Social Science and Medicine, 20: 241-245.

Glasgow, R. E. (1986). Smoking. In K. A. Holroyd & T. L. Creer (Eds.), Self-management of chronic disease: Handbook of clinical interventions and research (pp. 99-126). Orlando, FL: Academic Press.

Greene, J. C. (1985). Relationships among learning and attribution theory motivational variables. American Educational Research Journal, 22(1): 65-78.

Havik, O. E. & Maeland, J. G. (1988). Changes in smoking behavior after myocardial infarction. Health Psychology, 7: 403-420.

Hay, D. R. & Turbott, S. (1970). Changes in smoking habits in men under 65 years after myocardial infarction and coronary insufficiency. British Heart Journal, 32: 738-740.

Heckhausen, H. & Weiner, B. (1974). The emergence of a cognitive psychology of motivation. In B. Weiner (Ed.), Achievement motivation and attribution theory (pp. 49-66). Morristown, NJ: General Learning Press.

Heider, F. (1958). The psychology of interpersonal relations. Hillsdale, NJ: Lawrence Erlbaum Associates.

Hiroto, D. S. (1974). Locus of control and learned helplessness. Journal of Experimental Psychology, 102(2): 187-193.

Hjelle, L. A. & Clouser, R. (1970). Internal-external control of reinforcement in smoking behavior. Psychological Reports, 26: 562.

Horwitz, M. B., Hindi-Alexander, M. & Wagner, T. J. (1985). Psychosocial mediators of abstinence, relapse, and continued smoking: A one-year follow-up of a minimal intervention. Addictive Behaviors, 10: 29-39.

James, W. H., Woodruff, A. B. & Werner, W. (1965). Effect of internal and external control upon changes in smoking behavior. Journal of Consulting Psychology, 29: 184-186.

Jones, E. E. & Sigall, H. (1971). The bogus pipeline: A new paradigm for measuring affect and attitude. Psychological Bulletin, 76: 349-364.

Kanfer, F. H. & Karoly, P. (1972). Some additional conceptualizations. In R. C. Johnson, P. R. Dokecki & O. H. Mowrer (Eds.), Conscience, contract, and social reality: Theory and research in behavioral science (pp. 428-437). NY: Holt, Rinehart & Winston.

Kanfer, F. H. & Karoly, P. (1982). The psychology of self-management: Abiding issues and tentative directions. In P. Karoly & F. H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 571-599). NY: Pergamon Press.

Kanfer, F. H. & Stevenson, M. K. (1985). The effects of self-regulation on concurrent cognitive processes. Cognitive Therapy and Research, 9: 667-684.

Kaplan, G. D. & Cowles, A. (1978). Health locus of control and health value in the prediction of smoking reduction. Health Education Monographs, 6: 129-137.

Karoly, P. (1985). The logic and character of assessment in health psychology: Perspectives and possibilities. In P. Karoly (Ed.), Measurement strategies in health psychology (pp. 3-45). NY: John Wiley & Sons.

Kaufert, J. M., Rabkin, S. W., Syrotuik, J., Boyko, E. & Shane, F. (1986). Health beliefs as predictors of success of alternate modalities of smoking cessation: Results of a controlled trial. Journal of Behavioral Medicine, 9: 475-489.

Kendall, P. C. & Turk, D. C. (1984). Cognitive-behavioral strategies and health enhancement. In J.D. Matarazzo, S. M. Weiss, J.A. Herd, N.E. Miller & S. M. Weiss (Eds.), Behavioral health: A handbook of health enhancement and disease prevention (pp. 393-405). NY: John Wiley & Sons.

Kirscht, J. P. (1972). Perceptions of control and health beliefs. Canadian Journal of Behavioral Sciences, 4: 225-237.

Krantz, D. S. & Schulz, R. (1980). A model of life crisis, control, and health outcomes: Cardiac rehabilitation and relocation of the elderly. In A. Baum & J. E. Singer (Eds.), Advances in environmental psychology: Vol. 2. Applications of personal control (pp. 23-57). Hillsdale, NJ: Lawrence Erlbaum Associates.

Kristiansen, C. M. (1985). Smoking, health behavior, and value priorities. Addictive Behaviors, 10: 41-44.

Lau, R. R. (1982). Origins of health locus of control beliefs. Journal of Personality and Social Psychology, 42: 322-334.

Lau, R. R., Hartman, K. A. & Ware, J. E. (1986). Health as a value: Methodological and theoretical considerations. Health Psychology, 5: 25-43.

Lehr, B. K. & Schefft, B. K. (1987, August). Self-management therapy versus cognitive-behavioral therapy in cardiac rehabilitation. Paper presented at the meeting of the American Psychological Association, New York City.

Levenson, H. (1973). Multidimensional locus of control in psychiatric patients. Journal of Consulting and Clinical Psychology, 49: 982-984.

Levenson, H. (1981). Differentiating among internality, powerful others, and chance. In H. M. Lefcourt (Ed.), Research with the locus of control construct: Vol. 1. Assessment methods (pp. 15-63). NY: Academic Press.

Leventhal, H., Meyer, D. & Nerenz, D. (1980). The common sense representation of illness danger. In S. Rachman (Ed.), Contributions to medical psychology (Vol. 2, pp. 7-30). NY: Pergamon Press.

Leventhal, H. & Nerenz, D. R. (1985). The assessment of illness cognition. In P. Karoly (Ed.), Measurement strategies in health psychology (pp. 517-554). NY: John Wiley & Sons.

Leventhal, H., Zimmerman, R. & Gutmann, M. (1984). Compliance: A self-regulation perspective. In W. D. Gentry (Ed.), Handbook of behavioral medicine (pp. 369-436). NY: Guilford Press.

Lewis, F. M., Morisky, D. E. & Flynn, B. S. (1978). A test of the construct validity of health locus of control: Effects on self-reported compliance for hypertensive patients. Health Education Monographs, 6: 139-148.

Lichtenstein, E. (1982). The smoking problem: A behavioral perspective. Journal of Consulting and Clinical Psychology, 50: 804-819.

Linn, M. W., Skyler, J. S., Linn, B. S., Edelstein, J. & Sandifer, R. (1985). A possible role for self-management techniques in control of diabetes. Diabetes Educator, 11(2): 13-16.

Maiman, L. A. & Becker, M. H. (1974). The Health Belief Model: Origins and correlates in psychological theory. Health Education Monographs, 2: 336-353.

Marlatt, G. A. & Parks, G. A. (1982). Self-management of addictive behaviors. In P. Karoly & F. H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 443-488). NY: Pergamon Press.

McCusker, J. & Morrow, G. (1979). The relationship of health locus of control to preventive health behaviors and health beliefs. Patient Counseling and Health Education, 1: 146-150.

Moss, R. A., Prue, D. M., Lomax, D. & Martin, J. E. (1982). Implications of self-monitoring for smoking treatment: Effects on adherence and session attendance. Addictive Behaviors, 7: 381-385.

Nagy, V. T. & Wolfe, G. R. (1984). Cognitive predictors of compliance in chronic disease patients. Medical Care, 22: 912-921.

Ockene, J. K., Hosmer, D., Rippe, J., Williams, J., Goldberg, R. J., DeCosimo, D., Maher, P. M. & Dalen, J. E. (1985). Factors affecting cigarette smoking status in patients with ischemic heart disease. Journal of Chronic Diseases, 38: 985-994.

O'Connell, J. K. & Price, J. H. (1985). Development of a Heart Disease Locus of Control Scale. Psychological Reports, 56: 159-164.

Pechacek, T. F., Fox, B. H., Murray, D. M. & Luepker, R. V. (1984). Review of techniques for measurement of smoking behavior. In J. D. Matarazzo, S. M. Weiss, J. A. Herd, N. E. Miller & S. M. Weiss (Eds.), Behavioral health: A handbook of health enhancement and disease prevention (pp. 729-754). NY: John Wiley & Sons.

Pederson, L. L. (1982). Compliance with physician advice to quit smoking: A review of the literature. Preventive Medicine, 11: 71-84.

Pederson, L. L., Wanklin, J. M. & Baskerville, J. C. (1984). The role of health beliefs in compliance with physician advice to quit smoking. Social Science and Medicine, 19: 573-580.

Pedahzur, E. J. (1982). Multiple regression in behavioral research: Explanation and prediction (2nd ed.). NY: Holt, Rinehart & Winston.

Petitti, D. B., Friedman, G. D. & Kahn, W. (1981). Accuracy of information on smoking habits provided on self-administered research questionnaires. American Journal of Public Health, 71: 308-311.

Phares, E. J. (1972). Internal-external control as a determinant of amount of social influence exerted. In J. B. Rotter, J. E. Chance, & E. J. Phares (Eds.), Applications of a social learning theory of personality (pp. 359-365). New York: Holt, Rinehart & Winston.

Pomerleau, O. F. (1979). Commonalities in the treatment and understanding of smoking and other self-management disorders. In N. A. Krasnegor (Ed.), Behavioral analysis and treatment of substance abuse (Research Monograph No. 25, pp. 140-156). Rockville, MD: National Institute on Drug Abuse.

Prochaska, J. O. & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. Journal of Consulting and Clinical Psychology, 51: 390-395.

Prue, D. M., Scott, R. R. & Denier, C. A. (1985). Behavioral assessment of smoking behavior. In W. W. Tryon (Ed.), Behavioral assessment in behavioral medicine (pp. 66-115). NY: Springer Publishing Company.

Public Health Service. (1979). Smoking and health: A report of the Surgeon General (DHEW Publication No. PHS 79-50066). Washington, DC: U.S. Government Printing Office.

Public Health Service. (1983). The health consequences of smoking: Cardiovascular disease. A report of the Surgeon General (DHHS Publication No. PHS 84-50204). Washington, DC: U.S. Government Printing Office.

Public Health Service. (1984). The health consequences of smoking: Chronic obstructive lung disease. A report of the Surgeon General (DHHS Publication No. PHS 84-50205). Washington, DC: U.S. Government Printing Office.

Rodin, J. (1982). Biopsychosocial aspects of self-management. In P. Karoly & F. H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 60-92). NY: Pergamon Press.

Rose, G. & Udechuku, J. C. (1971). Cigarette smoking by hospital patients. British Journal of Preventive and Social Medicine, 25: 160-161.

Rosenberg, L., Palmer, J. R. & Shapiro, S. (1990). Decline in the risk of myocardial infarction among women who stop smoking. New England Journal of Medicine, 322: 213-217.

Rosenstock, I. M. (1966). Why people use health services. Milbank Memorial Fund Quarterly, 44 (3, Part 2): 94-124.

Rossi, J. S., Prochaska, J. O. & DiClemente, C. C. (1987, August). Processes of change in heavy and light smokers. Paper presented at the meeting of the American Psychological Association, New York City.

Rotter, J. B. (1954). Social learning and clinical psychology. Englewood Cliffs, NJ: Prentice-Hall.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80 (1, Whole No. 609): 1-28.

Rotter, J. B. (1972). Beliefs, social attitudes and behavior: A social learning analysis. In J. B. Rotter, J. E. Chance, & E. J. Phares (Eds.), Applications of a social learning theory of personality (pp. 335-350). New York: Holt, Rinehart & Winston.

Rotter, J. B. (1975). Some problems and misconceptions related to the construct of internal versus external control of reinforcement. Journal of Consulting and Clinical Psychology, 43: 56-67.

Rotter, J. B. (1982). The development and applications of social learning theory. New York: Praeger.

Sandler, I., Reese, F., Spencer, L. & Harpin, P. (1983). Person x environment interaction and locus of control: Laboratory, therapy, and classroom studies. In H. M. Lefcourt (Ed.), Research with the locus of control construct: Vol. 2. Developments and social problems (pp. 187-251). NY: Academic Press.

SAS Institute, Inc. (1985). SAS user's guide: Statistics, Version 5 edition. Cary, NC: SAS Institute, Inc.

Schmitz, J. M., Garcia, M. E. & Doerfler, L. A. (1987, August). People who quit smoking on their own: How they cope. Paper presented at the meeting of the American Psychological Association, New York City.

Schulman, B. A. (1979). Active patient orientation and outcomes in hypertensive treatment: Application of a socio-organizational perspective. Medical Care, 17: 267-280.

Scott, R. R. & Lamparski, D. (1985). Variables related to long-term smoking status following cardiac events. Addictive Behaviors, 10: 257-264.

Seeman, M. & Evans, J. W. (1962). Alienation and learning in a hospital setting. American Sociological Review, 27: 772-783.

Seligman, M. E. P. (1975). Helplessness: On depression, development and death. San Francisco: W.H. Freeman and Company.

Shipley, R. H. (1981). Maintenance of smoking cessation: Effect of follow-up letters, smoking motivation, muscle tension, and health locus of control. Journal of Consulting and Clinical Psychology, 49: 982-984.

Smith, R. E. (1970). Changes in locus of control as a function of life crisis resolution. Journal of Abnormal Psychology, 75: 328-332.

Straits, B. C. & Sechrest, L. (1963). Further support of some findings about the characteristics of smokers and nonsmokers. Journal of Consulting Psychology, 27: 282.

Strickland, B. R. (1978). Internal-external expectancies and health-related behaviors. Journal of Consulting and Clinical Psychology, 46: 1192-1211.

Swan, G. E., Parker, S. D., Chesney, M. A. & Rosenman, R. H. (1985). Reducing the confounding effects of environment and diet on saliva thiocyanate values in ex-smokers. Addictive Behaviors, 10: 187-190.

Tabachnick, B. G. & Fidell, L. S. (1989). Using multivariate statistics (2nd ed.). NY: Harper & Row.

Thoresen, C. E. & Mahoney, M. J. (1974). Behavioral self-control. NY: Holt, Rinehart & Winston.

Turk, D. C. & Kerns, R. D. (1985). Assessment in health psychology: A cognitive-behavioral perspective. In P. Karoly (Ed.), Measurement strategies in health psychology (pp. 335-372). NY: John Wiley & Sons.

Wallston, K. A., Maides, S. & Wallston, B. S. (1976). Health-related information seeking as a function of health-related locus of control and health value. Journal of Research in Personality, 10: 215-222.

Wallston, B. S. & Wallston, K. A. (1978). Locus of control and health: A review of the literature. Health Education Monographs, 6: 107-117.

Wallston, K. A. & Wallston, B. S. (1981). Health locus of control scales. In H. M. Lefcourt (Ed.), Research with the locus of control construct: Vol. 1. Assessment methods (pp. 189-243). NY: Academic Press.

Wallston, B. S. & Wallston, K. A. (1984). Social psychological models of health behavior: An examination and integration. In A. Baum, S. E. Taylor & J. E. Singer (Eds.), Handbook of psychology and health: Vol. IV. Social psychological aspects of health (pp. 23-53). Hillsdale, NJ: Lawrence Erlbaum Associates.

Wallston, K. A., Wallston, B. S. & DeVellis, R. (1978). Development of the Multidimensional Health Locus of Control (MHLC) Scales. Health Education Monographs, 6: 160-170.

Wallston, B. S., Wallston, K. A., Kaplan, G. D. & Maides, S. A. (1976). Development and validation of the Health Locus of Control Scale. Journal of Consulting and Clinical Psychology, 44: 580-585.

Weinberger, M., Greene, J. Y., Mamlin, J. J. & Jerin, M. J. (1981). Health beliefs and smoking behavior. American Journal of Public Health, 71: 1253-1255.

Weiner, B. (1974a). A conceptual analysis of locus of control. In B. Weiner (Ed.), Achievement motivation and attribution theory (pp.105-113). Morristown, NJ: General Learning Press.

Weiner, B. (1974b). Achievement motivation as conceptualized by an attribution theorist. In B. Weiner (Ed.), Achievement motivation and attribution theory (pp. 3-48). Morristown, NJ: General Learning Press.

Weiner, B., Nierenberg, R. & Goldstein, M. (1976). Social learning (locus of control) versus attributional (causal stability) interpretations of expectancy of success. Journal of Personality, 44: 52-68.

West, D. W., Graham, S., Swanson, M. & Wilkinson, G. (1977). Five year follow-up of a smoking withdrawal clinic population. American Journal of Public Health, 67: 536-544.

Zimmerman, B. J. & Martinez-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. American Educational Research Journal, 23: 614-628.