The Role of Self-Efficacy in Adherence to Relaxation Practice Among Cardiac Rehabilitation Patients

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Dissertation submitted to the School of Graduate Studies,
University of Ottawa in partial fulfillment
of the requirements for the Ph.D. degree
in Clinical Psychology

ACKNOWLEDGEMENTS

This study would not have been possible without the support and commitment of many colleagues and friends. The research training I have received under the supervision of Dr. Robert Flynn, my dissertation advisor, has been one of the most fulfilling and rewarding experiences of my academic career. His thoughtful and scholarly advice, and ongoing encouragement, facilitated solutions to complex problems encountered in the course of this work. I would also like to thank the members of my dissertation committee: Drs. Patrick McGrath, Henry Edwards, John Hunsley, and Philip Firestone whose appraisals contributed substantively to the study. Dr. Roy Cameron, my external examiner, provided insightful criticism. Herman van den Bergen, Bob Spratt, and Madane Masakere, from the School of Psychology Workshop, did outstanding work on the development of the Relaxation Practice Monitor. I appreciate very much Dr. Pierre Ritchie's ongoing friendship and interest in my professional development.

Special thanks are due to the staff of the Heart Institute Prevention and Rehabilitation Centre where this research was conducted. Drs. Bill Dafoe and Malcolm Rose gave me unrestricted access to their patients and clinic resources. Gayle Cronin, Laura Cupper, Sue McHardy, and Pat O'Farrell gave much of their time and worked with great enthusiasm and dedication as the therapists in the study. I truly appreciate the support of my colleagues in the Department of Epidemiology and Community

Medicine, who generously gave me statistical consultation and resources essential to the completion of the study. Over the past three years, Drs. Ian McDowell and Corrine Dulberg have taught me much and significantly influenced my research perspective. The help of Mariella Peca, Monica Prince (who tamed the mainframe computer and resolved programming problems), and Rena McEwen was invaluable in managing the data set and dealing with word-processing problems.

Joanne Hakkaku was responsible for the day-to-day operation of this project. The consistent quality of the data is due largely to her tremendous organizational abilities, diligence, and genuine warmth and concern she expressed toward our participants. I will always be thankful for her dedication to the study, and the efforts she expended on its behalf.

The most significant contribution to this work was made by my spouse, Andrée Cazabon. Words cannot adequately convey the extent of my gratitude for her caring and support. Her assistance in piloting interventions, designing instruments, coding data, typing numerous revisions of the manuscript, preparing data tables, her calming influence during times of high stress, and confidence in me have been central to the successes I've experienced in graduate school. I feel very fortunate to have shared these stimulating and enriching years with her.

This study was funded by NHRDP, Health and Welfare Canada through a Ph.D. Fellowship and a concomitant Research Grant (#6606-2981-44) to S. Hotz. This financial support is greatly appreciated.

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1. ABSTRACT

Non-adherence to behavioural interventions in health care remains a prevalent problem. In cardiac rehabilitation programmes, relaxation training is a common component of interventions designed to reduce patients' psychophysiological reactivity to life-stressors. Despite evidence supporting the efficacy of relaxation procedures, some patients appear to have difficulty adhering to relaxation practice prescriptions. A number of cognitive-behavioural models, drawing upon Bandura's self-efficacy construct, have been proposed to explain adherence. This randomized study of 121 cardiac rehabilitation outpatients employed a comparative design and had two primary objectives: 1) to enhance self-efficacy in relation to relaxation practice; and, 2) to determine the extent to which self-efficacy and/or outcome expectancy mediated adherence to the relaxation practice prescription. A secondary objective was to determine the effects of treatment-induced adherence on state anxiety. Adherence was measured using a Relaxation Practice Monitor (a micro-electronic device concealed within a tape recorder, with a relaxation tape sealed in the tape compartment) which each patient was given to use for relaxation practice. Participants were randomly assigned to either an experimental treatment condition which received a cognitive-behavioural stress management intervention <u>plus</u> a self-efficacy-enhancing intervention, or to a control condition which received only the stress management intervention. Both conditions received seven consecutive once-weekly treatment sessions of 1.5 hours duration. The participants were compared on levels of self-efficacy and outcome expectancy throughout treatment. Adherence was measured throughout treatment and the four weeks prior to follow-up. Anxiety was measured at pre-treatment, post-treatment and follow-up four weeks after the completion of treatment. The results of repeated measures ANOVA revealed that, throughout treatment, patients in the experimental condition had significantly higher levels of both self-efficacy and adherence than did controls. Treatment condition had no significant effect on outcome expectancy over time. Although there was no significant effect of treatment on state anxiety, there was a significant within- subjects reduction in anxiety from pre-treatment to follow-up. Path analyses revealed that neither self-efficacy nor outcome expectancy were important mediators of treatment effects, and that adherence did not mediate the effects of treatment on changes in state anxiety. These results suggest limits to Bandura's contention that self-efficacy is the central mediator of behaviour change, at least insofar as adherence to relaxation practice is concerned. In addition, the results raise questions regarding the importance of relaxation practice for anxiety reduction. The implications of these findings for a theory of adherence, for research on adherence to relaxation practice, and for the clinical use of relaxation in cardiac rehabilitation programmes were discussed.

2. INTRODUCTION

Increased recognition of the role played by psychological, social, and behavioural variables in heart disease has provided impetus for research on such factors as stressful life events, stress reactivity, social support, the coronary prone behaviour pattern, dietary patterns, exercise, and smoking (Brownstein & Herd, 1986; Surwit, Williams & Shapiro, 1982; Hamburg, Elliot & Parron, 1982). Developing effective prevention and rehabilitation strategies aimed at controllable risk factors are central national health goals (Epp, 1986).

Stress and its effects is one of a number of at least partially controllable risk factors. Stressors related to chronic illness, disruptions in family life, employment and economic uncertainty, altered lifestyle, and the threat of future cardiac dysfunction are commonly encountered by cardiac patients (Hackett & Cassem, 1984; Krantz & Deckell, 1983; Mayou, MacMahon, Sleight, & Florencio 1981; Oldenberg, Perkins, & Andrews, 1985). The Framingham data indicate that these patients experience higher levels of daily stress, tension, and worry than do non-patient controls (Haynes, Levine, Scotch, Feinleib, & Kannel, 1978). Numerous retrospective studies have found higher levels of depression and anxiety in myocardial infarction (MI) and coronary artery bypass surgical (CABG) patients than in healthy controls, and prospective and meta-analytic studies document reliable associations among depression, hostility, anxiety, and cardiovascular disease (Jenkins, 1976; Booth-Kewley & Friedman, 1987).

Contemporary cardiac prevention and rehabilitation programmes include stress management interventions to help patients reduce their psychophysiological reactivity to stressors (Chen, O'Neill, Partenope & Strax, 1987; Daly, Hinckling, & Paz-Alphonso, 1987; Davidson, 1983; Oldridge, 1979; Bloom, 1979; Erdmann & Duivenvoorden, 1983; Schelling, 1979). In addition to risks posed by isolated intense stressors, minor chronic stressors have also been implicated in increasing risk for heart disease in individuals with coping deficits (Lazarus & Folkman, 1984; Gatchel, Gaffney, & Smith, 1986). Human studies of stress exposure have documented increased levels of serum cholesterol, increased heart rate and blood pressure, ventricular arrhythmias, and a variety of other pathophysiological cardiovascular events implicated in the development and recurrence of heart disease (Herd, 1984; Hamburg et al., 1982; Gentry, 1977).

The appraisal of situations or events as harmful, threatening, or challenging results in cardiovascular and neuroendocrine responses which are mediated by the sympathetic-adrenal medullary system and the pituitary-adrenal cortical axis (Lazarus & Folkman, 1984). These processes are believed to increase coronary risk by influencing the initiation and progression of atherosclerosis, or by precipitating coronary heart disease (Herd, 1984).

Although the specific pathways of interaction between stress reactivity and other cardiovascular risk factors in the production and maintenance of cardiovascular disorders remain unknown (Steptoe, 1981), their interrelationship is widely assumed, and research in psychoneuroimmunology (Ader, 1983) and behavioural epidemiology (Jenkins, 1982) has provided support for the premise. Consequently, it is believed that individuals who perceive and appraise their life stressors as threatening or harmful and have deficits in their ability to cope with such events experience elevated levels of psychophysiological arousal, which in turn increases risk for developing or exacerbating cardiovascular disease.

A number of disordered mechanisms of autonomic activity observed in cardiac disease are, to some extent, under the control of the central nervous system and are amenable to self-control strategies (Surwit et al., 1982). A growing body of literature indicates that stress management interventions, in particular relaxation, can be efficacious for individuals at risk and for those who already suffer from heart disease (Krantz, 1985; Chesney & Ward, 1985; Patel, Marmot, Terry, Carruthers, Hunt, & Patel, 1985; Lehrer & Woolfolk, 1984; Barr & Benson, 1984; Gatchel et al., 1986; Johnson, 1982; Taylor, 1980). This suggests that psychophysiological reactivity can be reduced in intensity and duration. The importance of such interventions is illustrated by Ruberman, Weinblatt, Goldberg, and Chaudhary (1984) who observed that post-MI patients with elevated levels of life stress and social isolation had four times greater a risk of death from reinfarction than did those with low levels of stress and isolation.

Unfortunately, interventions to reduce risk associated with heart disease suffer from substantial rates of non-adherence (Knapp & Blackwell, 1985). This is a treatment-effectiveness problem with major ramifications for primary intervention, long-term treatment, and programme evaluation. Variables such as hypertension, smoking, diet, exercise, and stress reactivity are potentially modifiable if patients are able to participate fully in prescribed medical and behavioural regimens. Rehabilitation in the post-acute phase of heart disease often requires adherence to complex new behaviours -- the benefits of which are not immediately apparent -- which may carry with them some degree of discomfort, deprivation, or intrusion into usual daily activities (Croog, 1983). Despite the availability of clinically efficacious interventions, a substantial proportion of patients fail to adhere (Gerber, 1986; Croog, 1983; Haynes, 1982). The lack of a broad theory of adherence limits the development of interventions to enhance adherence. However, a number of recent models which incorporate behavioural determinants of adherence may prove useful in generating a robust theory of adherence (Marlatt, 1985; Leventhal, Zimmerman, & Gutmann, 1984; Meichenbaum & Turk, 1987).

The present experiment attempted to enhance adherence to progressive muscle relaxation in a sample of cardiac rehabilitation patients by means of an intervention based on a cognitive-behavioural model of adherence. The primary objectives of the study were to enhance patients self-efficacy in relation to relaxation practice and to determine the extent to which self-efficacy and outcome expectancy were mediators of adherence. A secondary objective was to determine the effects of treatment-induced adherence to relaxation practice on changes in state anxiety.

3. REVIEW OF THE LITERATURE

3.1 Stress Reduction Interventions in Cardiovascular Disease

Haynes (1979) discusses the distinction between treatment efficacy (i.e., does the treatment work?) and treatment effectiveness (i.e., does it work and is it adhered to?). This section discusses stress management interventions in terms of efficacy. Adherence and treatment effectiveness are discussed in the subsequent section.

It is well known that cardiovascular diseases are among the foremost health problems of Western industrialized nations. Cardiovascular disease is the leading cause of premature death for Canadian males 40 years of age and older, and accounts for 28% of all deaths. These diseases ranked first in women aged 55 and older and accounted for 25% of all deaths (Health & Welfare Canada, 1987). Similar findings have been reported in U. S. studies (Department of Health, Education & Welfare, 1985).

The traditional risk factors for heart disease -- high blood cholesterol and triglyceride levels, high blood pressure, and cigarette smoking -- account for approximately 50% of the variance in rates of heart disease. One of the behavioural factors posing additional risk for cardiovascular disease is stress reactivity (Jenkins, 1982; Kaplan, 1983; Surwit et al., 1982; Roskies, 1983). In addition to facilitating dietary change, weight reduction, smoking cessation, and increasing aerobic fitness, reducing stress reactivity has become an important treatment objective in cardiac prevention and rehabilitation programmes (Krantz, 1985; Matarazzo, Connor, Fey, Carmody, Pierce, Brischetto, et al., 1983; Brammel, 1981; Herd, 1981; Coates, Perry, Killen, & Slinkard, 1981).

Despite relatively few controlled outcome studies, stress management intervention has been recommended to reduce the risk of recurrence (Razin, 1982). Attempts to reduce stress reactivity in patients in the post-acute phases of heart disease tend to employ multimodal protocols comprising relaxation training and cognitive techniques, and most are based on a stress inoculation model (Meichenbaum & Cameron, 1983; Meichenbaum, 1985). Psychological intervention immediately following myocardial infarction or surgery has been associated with reductions in psychological distress and somatic complications (Oldenberg et al., 1985; Langosch, Seer, Brodner, Kallinke, Kulick, & Heim, 1982; Mumford, Schlesinger & Glass, 1982). In a small randomized study, Gruen (1975) found that MI patients who received a brief psychotherapeutic intervention while in hospital had shorter hospital stays, fewer post-MI complications, less anxiety and less denial than did controls.

In the largest stress reduction trial to date, Freidman, Thoresen, Gill, Powell, Ulmer, Thompson et al. (1984), and Powell, Friedman, Thoresen, Gill, and Ulmer (1984) randomly assigned post-myocardial infarction patients to either a cardiology counselling group treatment or a Type A group employing relaxation training and cognitive stress management techniques to reduce patients physiological, cognitive and behavioural hyper-reactivity. At three year follow-up the group receiving the stress management intervention had a significantly lower rate of cardiac recurrences than did the cardiology counselling group due to a lower incidence of non-fatal myocardial infarctions.

In a randomized controlled trial which provided tailored stress management intervention and support for post-MI patients, Frasure-Smith & Prince (1985, 1986) demonstrated significant reductions in emotional and physical stress symptoms and a 50% reduction in one-year mortality rates in the treated group. With post-MI patients, Langosh et al. (1982) compared progressive muscle relaxation training and a cognitive behavioural stress management intervention against a no-treatment control. Following treatment the relaxation group had fewer cardiac complaints than did the other two groups. There was no difference on anxiety reduction between the two treatment groups; however, both treatment groups had significantly lower anxiety post-treatment than did the controls, whose anxiety increased during the study period. Yet, at three month follow-up, both treatment groups had significantly more psychological and physical symptom complaints than they did at the end of treatment.

Hospitalized MI patients who received an eight-session cognitive-behavioural stress management intervention had lower levels of depression and anxiety and fewer cardiac symptoms than did a standard-care control group (Baer, Cleveland, Montero, Revel, Clancy, & Bower, 1985). In an uncontrolled study of a ten-week stress management intervention in cardiac rehabilitation, Razin, Swenconis, and Zohman (1987) and Razin (1986) reported significant pre-post reductions in Type A behaviour scores, blood pressure reactivity to stressors, and psychological distress. The interpretation of these findings is further limited by the small sample (n=21) and data analysis which employed multiple uncorrected t-tests.

A cornerstone of stress management intervention is skill training for systematic relaxation. A number of investigators have reported that relaxation exercises are capable of reducing systolic and diastolic blood pressure, plasma norepinephrine, cholesterol and triglyceride levels, and myocardial contractility (Carson, Hathaway, Tuohey, & McKay, 1988; Patel et al., 1985; Charlesworth, Williams & Baer, 1984; Jacob & Chesney, 1984; Barr & Benson, 1984; Davidson, Winchester, Taylor, Alderman, & Ingels, 1979). These are components of the sympathetic-adrenal response, which is thought to be the bridge between behaviour and cardiovascular disease (Herd, 1984; Steptoe, 1981; Surwit et al., 1982). Johnson (1982) has noted that these physiological consequences of relaxation are unlikely to be due to non-specific treatment effects. The Patel et al. (1985) randomized trial of 192 patients at risk for heart disease found that patients who received eight weekly sessions of relaxation and stress management training had significantly greater decreases in systolic and diastolic blood pressure than did controls at post-treatment and eight-month follow-up, and that the controls had a significantly greater incidence of fatal myocardial infarction.

Overall, there is evidence for the efficacy of psychological interventions aimed at modifying cardiovascular risk disease factors and facilitating adjustment to cardiovascular disease (Chesney & Ward, 1985; Taylor, 1980; Best, 1981; Oldridge, 1979; Friedman et al., 1984). Unfortunately, these interventions are plagued by low levels of treatment adherence and maintenance of health behaviour change over time (Taylor, Agras, Schneider, & Allen, 1983; Russell, 1980; Fisher, Levenkron, Lowe, Loro, & Green, 1982).

3.2 Adherence to Treatment

3.2.1 Terminology and Definitions

Two terms are used in the literature to denote the degree to which treatment recommendations are carried out. The first, compliance, has been criticized for having roots in the traditional medical model wherein patients must respond passively to physician prescription (Meichenbaum & Turk, 1987). The second, adherence, suggests a collaborative, more evenly balanced relationship between the patient and the health care provider in which the patient's responsibility for health care outcomes is

acknowledged and the importance of the patient's perseverance, self-care,
and self-control is stressed (Turk, Salovey & Litt, 1986). There is no consensus in the literature on the use of these terms. But, given the conceptual framework guiding this study, the term adherence will be used.

As a subject of inquiry, adherence is subsumed within the domain of health behaviour research (Mechanic, 1978; Harris & Guten, 1979). It refers to the relative degree of action in response to prescribed or recommended preventive, health- enhancing, or illness-ameliorating behaviours. The most frequently cited conceptual definition of adherence is "the extent to which a person's behaviour -- taking medication, following a diet, executing lifestyle changes -- follows medical advice" (Haynes, 1979, pp. 1-2). This definition has been operationalized as the degree to which a regimen is followed in terms of percentage or ratio (Feinstein, 1974), a categorical classification (good vs. poor), or an index score comprising multiple relevant behaviours (Hays & DiMatteo, 1987). Gordis (1979) has suggested defining non-adherence as following treatment at a level below which the treatment target is likely to be reached. Operational definitions of adherence are numerous and vary between studies as do measurement techniques, making comparisons between studies difficult. However, non-adherence appears to be a problem in virtually every situation where some form of treatment self-administration is prescribed (Sackett & Snow, 1979).

3.2.2 Measurement of Adherence

Adherence measurement techniques vary across and within samples of patients and treatments studied. The validity and reliability of measures remain critical issues. Hays and DiMatteo (1987), Cluss and Epstein (1985), Gordis (1979), and Masur (1981) have reviewed the methodological and conceptual problems involved in the measurement of adherence.

Indirect, non-objective methods appear frequently in the literature. Most studies to date have used self-report, which has considerable potential for inaccuracy. Patients tend to under-report poor adherence and overestimate good adherence (Dunbar, 1979; Taylor et al., 1983; Hoelscher, Lichstein, & Rosenthal, 1986), and asking patients to self-monitor can act as an adherence-enhancing intervention (Meichenbaum & Turk, 1987). A number of behavioural observation methods such as pill counts, appointment-keeping, bioassay techniques, and in vivo observation of behaviour have been attempted. However, these are hard to conduct unobtrusively and directly, are often not specific to the actual target behaviour required by the regimen, and have the potential to be reactive. Clinician subjective ratings of patient adherence have been used, but are unreliable when compared to more direct measures (Dunbar, 1979; Gordis, 1979).

The use of clinical outcome as a measure of adherence is problematic, as the nature and magnitude of the relationship between adherence level and outcome is not generally known (Epstein & Cluss, 1982). Patients may unsystematically add components to the intervention, and individual differences may affect the relationship between adherence and outcome.

Most attempts to measure adherence have significant validity and reliability problems because they do not provide direct, objective, and unobtrusive measures at multiple timepoints over the treatment regimen. Recently, there has been some interest in the development and application of objective mechanical monitors to measure adherence directly and unobtrusively. Moulding (1979) developed a recording pill dispenser which indicates the consistency over time with which patients take their medication. Norell (1979) reported on an automatic eye-dropper capable of recording the time and frequency the dropper was used by glaucoma patients. Waggoner and LeLieuvre (1981) have used a hand exerciser with an electronic counter to measure exercise adherence in arthritic patients. Ferguson and Taylor (1980) noted the emergence of innovative techniques to measure behaviour directly. With regard to relaxation practice, they were the first to suggest that a device built into a tape recorder might be used to count the number of times a relaxation tape had been used. Subsequently, a number of investigators developed tape recorders containing electronic devices which unobtrusively measure subjects' use of a relaxation tape (Taylor et al., 1983; Lichstein & Hoelscher, 1986; Hoelscher, 1984). These researchers convincingly demonstrated significant over-estimation of practice by self-report when compared to machine measures.

Regardless of the technical sophistication of the devices, none provides actual data on adherence. Rather, they measure use of the device itself (Cluss & Epstein, 1985). For example, in the case of the medication monitor, there is no way of knowing whether a patient has taken the medication out and discarded it, or if the medication was taken by someone other than the patient. Similarly, with the tape recorders, there is no way of knowing whether the patient was actually doing the relaxation exercise while the tape was being played, or if someone other than the patient used the machine. However, when employed unobtrusively, the mechanical measures probably provide the most accurate estimates of adherence.

3.2.3 Magnitude of the Problem of Non-Adherence

General Findings and Limitations in the Literature

As was previously alluded to, the effectiveness of treatment in the rehabilitation of chronic disease depends on two factors: the efficacy of treatment and the degree of patient adherence. The extent of non-adherence has been well documented in many recent reviews: between

4% and 92% of patients do not adhere to health prescriptions and across studies an average of 33% do not adhere (Sackett & Snow, 1979; Masur, 1981; Masek, 1982; Dunbar, 1979; Dunbar & Agras, 1980; Gerber, 1986; Meichenbaum & Turk, 1987; Epstein & Cluss, 1982; Turk et al., 1986).

Non-adherence to treatment recommendations has many forms: failure to take medication appropriately; failure to comply with preventive health and behaviour/lifestyle change prescriptions; not following oral hygiene recommendations; or dropping out of exercise, diet/weight loss programmes or psychotherapy. These are but a few of the problems that have been addressed in the research literature since the early 1960's. Samples studied range from patients with acute and chronic illnesses to healthy individuals embarking on health promotion/disease prevention programmes, all of whom have been asked to follow regimens varying in complexity and duration.

The literature comprises mainly descriptive studies on single patient groups aimed at determining adherence rates and comparing those who adhered with those who did not (Haynes, 1979). There are relatively few controlled studies evaluating interventions to increase adherence and determining the effect of increased adherence on clinical outcomes. Most work has been carried out on adherence to medication prescription (Cluss & Epstein, 1985). Although it is known that adherence is a problem across many illnesses and interventions, there are few studies that are based on theories of adherence behaviour (Meichenbaum & Turk, 1987; Haynes, 1982). Recently, Becker and Rosenstock (1984) found more literature reviews pertaining to adherence than original studies. Few studies have examined how adherence varies over time within a prescribed regimen (Dunbar, 1979).

Accurate estimates of non-adherence are hard to obtain for four general reasons: 1) adherence is operationalized differently across similar patient samples and diseases; 2) adherence is known to vary across situational contexts; 3) samples studied may not be representative of the populations they are drawn from e.g., they may be more adherent because of their consent to participate in an adherence study (Meichenbaum & Turk, 1987; Dunbar, 1979; Cluss & Epstein, 1985; Gordis, 1979); and 4) commonly used outcome measures such as dropout from treatment may have little relationship to whether the individual is actually adhering to the treatment target.

Depending on the regimen under study, prevalence rates for non-adherence range between 4% and 92%, with the highest rates typically found in chronic illness regimens, behavioural/ lifestyle-change programmes and health-promotion interventions where salient results are not achieved immediately (Meichenbaum & Turk, 1987; Cummings, Becker, Kirscht, & Levin, 1981; Kirscht & Rosenstock, 1979). For example, across studies approximately 60% of participants drop out of lifestyle-change programmes (Kirscht & Rosenstock, 1979). The prevalence of non-adherence across different disorders and interventions has been the subject of many extensive reviews over the last 12 years (Haynes, 1979; Masur, 1981; Masek, 1982; Dunbar, 1979; Dunbar & Agras, 1980; Meichenbaum & Turk, 1987). Only findings relevant to the present study are discussed in this section.

Adherence to Behavioural and Lifestyle-Change Interventions in Cardiovascular Disease

For patients with cardiovascular disease, adherence has been assessed for a number of regimens. Descriptive studies indicate that, because of non-adherence, fewer than 30% of hypertensives benefit from treatment (Haynes, 1979; Epstein & Cluss 1982). Evaluations of lifestyle-change programmes aimed at facilitating weight loss and diet change, smoking cessation, increasing exercise frequency and reducing blood pressure and psychophysiological reactivity to stressors report low adherence rates of between 8% and 40% (Sackett & Snow, 1979; Oldridge & Jones, 1983; Stunkard, 1981; Taylor et al., 1983; Hoelscher, Lichstein, & Rosenthal, 1984, 1986; Kirscht & Rosenstock, 1979). Although considerable data indicate the efficacy of behavioural treatment for risk-reduction, as evidenced by behaviour change during intervention, these programmes tend to suffer from high drop-out rates and from relapse following the termination of treatment (Dishman & Ickes, 1981; Oldridge & Jones, 1983; Marlatt, 1982). For example, 69%-90% of smokers who complete treatment stop smoking by the end of the intervention yet, at one year follow-up, only 25%-30% remain abstainers (Leventhal et al., 1984).

Between studies, the range of adherence is quite broad. Typically, studies employing patient self-report or clinician estimates as measures report higher adherence rates than do those using more direct behavioural measures such as attendance at treatment sessions or objective monitoring of health behaviours. Although the extent to which adherence is related to health outcomes has not been determined for many interventions (Hoelscher, 1987; Epstein, 1984; Dunbar & Agras, 1980), some data exist which underscore the importance of adherence for cardiovascular disease interventions.

Epidemiological studies have shown that adherence to behavioural recommendations aimed at such cardiovascular risk factors as high blood pressure, cigarette smoking, elevated serum cholesterol and stress reactivity can reduce the incidence of morbidity, mortality, and complications associated with cardiovascular disease (Brownstein & Herd, 1986; Multiple Risk Factor Intervention Trial Group, 1982; Hypertension Detection and Follow-up Program Cooperative Group, 1979; Lipid Research Clinics Programme, 1984; Hjermann, Holme, Leren, & Byre, 1981). Across these studies there was nearly a two-fold difference in risk reduction and mortality for those who adhered (Brownstein & Herd, 1986). Mayou et al. (1981) found that dropouts from a cardiac rehabilitation programme had significantly worse physiological and psychosocial outcomes than did those who completed treatment. Erdmann &

Duivenvoorden (1983) reported a trend for cardiac rehabilitation participants to experience less intense anxiety and social inadequacy than did standard treatment controls. While one study has reported that cardiac rehabilitation patients were more adherent to medical treatment generally than routine care controls, no data on the extent of adherence was presented (Rovario, Holmes & Holmstein, 1984). Shephard, Corey, and Kavanaugh (1981) found that adherence was associated with a five-fold reduction in risk for morbidity and mortality in an exercise programme for post-MI patients. Psychological and vocational adjustment at one year post-MI was predicted by adherence in a cardiac rehabilitation programme (Burgess, Lerner, D'Agostino, Vokonas, Hartman & Gaccione, 1987).

Stunkard (1981) noted that as few as 20% of clients adhere to behaviour change prescriptions during behavioural weight control treatment, and 70% of participants drop out of these programmes (Dunbar & Agras, 1980). The drop-out rate in exercise programmes for cardiac patients is about 40% for short term (six-month) programmes (Oldridge, 1979; Oldridge & Jones, 1983), and 50% can be expected to dropout within one year, with only 18% of patients remaining in long-term programmes (Carmody, Senner, Malinow, & Matarazzo, 1980). Martin and Dubbert (1982) report a range of attrition of between 30% and 70% for general physical exercise programmes. It should be noted that drop-out rates as measures of adherence do not rule out the possibility that behaviour changed in contexts removed from the formal treatment programmes. Data from multimodal cardiac rehabilitation programmes indicate that between 20% and 24% of post-MI patients can be expected to drop-out (Mayou et al., 1981; Erdmann & Duivenvoorden, 1983).

Adherence to behavioural and lifestyle intervention is still a relatively unexplored area. Much of this literature is only secondarily interested in adherence, and measurement is generally limited to determining dropout rates. As a group, therapies aimed at changing habitual behaviours demand motivation for an extended period of time; in the case of diet, exercise and preventive stress management programmes, perhaps for a lifetime. Martin, Collins, Hillenberg, Zabin, and Katell (1981) note that the efficacy of behavioural intervention depends on consistent practice between treatment sessions to build skills. Consistent with the findings of the general adherence literature, it has proven difficult for some cardiac patients to follow complex, long-term regimens (Knapp & Blackwell, 1985).

Adherence To Prescribed Relaxation Practice

Researchers and clinicians interested in the effectiveness of relaxation training cite the importance of regular home practice to support generalization and maintenance (Collins, Martin, & Hillenberg, 1982; Blanchard & Miller, 1977; Bernstein & Borkovec, 1973; Lichstein & Hoelscher, 1986; Bernstein & Given, 1984; Pinkerton, Hughes & Wenrick, 1982; Turk, Meichenbaum, & Genest, 1983; Russell, 1980). However, many studies appear to ignore this issue (Carson et al., 1988;

Charlesworth et al., 1984; Friedman et al., 1984; Bohachick, 1984; Barr & Benson, 1984; Oldenberg et al., 1985; Frasure-Smith & Prince, 1985, 1986; Bloom, 1979; Suinn, 1974) or refer only to dropout rates which range between 0 and 43% (Blanchard, 1979; Crowther, 1983; Drazen, 1982; Glasgow, 1981, Frankel, 1978; Seer & Raeburn, 1980; Hafner, 1982; Funch & Gale, 1986; Lehrer, Hochron, McCann, Swartzmann, & Reba, 1986).

Because relaxation practice is a behaviour which occurs outside the treatment setting, it has been difficult to obtain valid and reliable measures of adherence. In addition to calculating drop-out rates, two basic data-gathering strategies have been used in most studies where adherence to relaxation practice has been assessed: patient self-report and report by other individuals in the patient's environment. These approaches may lack reliability and validity in that they are open to falsification and are reactive.

When adherence to relaxation training in a sample of cardiac patients was assessed at three-month follow-up, using patient self-report as the measure of adherence, 53% of patients were "regularly" practicing (Langosch et al., 1982). These authors did not measure adherence during treatment and the uncontrolled design employed is typical of most studies in this area. In a study with similar design weaknesses, Razin (1987) reported relaxation practice adherence rates of 80-90% in a small cardiac rehabilitation sample during treatment, but provided no follow-up data.

In a controlled study which attempted to increase adherence to relaxation practice, Bennett & Millard (1985) provided additional procedural and rationale information about the relaxation exercise to their experimental subjects. All subjects were instructed to practice once daily for a three-week period and to record practice in a diary. None of the information provision conditions had a significant effect on self-reported adherence, and differences in knowledge of relaxation had no relationship to adherence. Of three health belief model factors assessed, only perceived severity of anxiety was significantly and moderately correlated with adherence. These authors did not present any data regarding adherence rates.

Libo & Arnold (1983), in a one-to-five year follow-up study of 58 relaxation patients, found that 15% of patients reported practicing daily, 27% practiced once per week, 44% "occasionally" and only 14% stated they had stopped practicing entirely. Eighty-five percent of the group who practiced at least occasionally reported continued treatment gains, while half of those who stopped entirely also reported improvement. The lack of objective measurement of symptom improvement, failure to control for time elapsed since treatment, and the weak retrospective self-report adherence measure used seriously limit the validity of these findings.

Using self-reported adherence, Patel et al. (1985), in a four-year follow-up of cardiac stress management patients, determined that 17% of the sample still practiced relaxation "regularly", and only 3% stated they practiced daily. Those who reported practicing at least regularly had significantly greater reductions in systolic and diastolic blood pressure than those who were not practicing.

Carson et al. (1988) taught relaxation to a group of patients at risk for heart disease. In addition to reporting significant decreases in blood pressure and serum cholesterol, they stated practice adherence levels were very high but unfortunately provide no data to support this statement.

In attempts to overcome the limitations of self-report measures, a number of monitoring devices have been developed to directly measure use of a relaxation tape. The first, described by Martin et al. (1981), uses a one-second 250 Hz. tone superimposed on a pre-recorded relaxation tape and requires that patients record the presence of the tone after each practice session. Adherence is assessed by comparing the subjects record with the actual coding of the tone. While representing a significant advance in behavioural assessment technology, this technique has a number of problems in that subjects are aware that adherence is an issue, thus adding an element of reactivity; subjects must remain vigilant to detect the tone; and monitoring for the tone and recording its occurrence adds an extra component to the practice task.

A similar device was used by Jacob, Beidel, & Shapiro (1984), who employed different code-words recorded at the end of a series of relaxation tapes. Subjects were required to note the code-word on a daily practice diary. From a small sample of 17 hypertensive patients who were prescribed one relaxation practice session daily, these investigators reported an average adherence rate of 82.3%, with 77% of patients reaching practice levels greater than 80%, and only 8% of the sample achieving levels less than 50%. In this study there was no trend toward increasing or decreasing adherence over the course of treatment and there was no significant association between adherence level and blood pressure reduction. In addition to the small sample, the results of this study have limited interpretability given that patients were aware that their practice was being monitored.

Taylor et al. (1983) reported a major advance in unobtrusive measurement of relaxation practice. In a study of 23 hypertensive patients receiving 8 weeks of relaxation training, they employed a tape recorder with a built-in microelectric circuit capable of recording when the relaxation tape was turned on and off. Patients were unaware of this device, were told to practice a minimum of five times per week, and were also told to keep a diary of relaxation practice. The device revealed that only 39% of patients adhered to the prescribed level, while the self-report measure indicated an adherence rate of 71%. They observed that adherence dropped over time from an average of 6.1 sessions per week in week 1 to 2.5 per week by week 8. Over the entire study, the adherence rate was 55%. These investigators also found no significant correlation between level of adherence and blood pressure reduction. However, these results must be interpreted carefully as home practice was not emphasized as an important part of treatment in the rationale provided to patients.

Riley (1985) and Riley, Berry, and Kennedy (1986) added an electronic rewind counter to a tape recorder to count the number of times that the rewind button was pressed. This device could not measure practice time, or determine whether the entire exercise had been played. Fifty-two patients with "tension or tension-related" disorders received a one-session training programme in progressive muscle relaxation. The experimental intervention comprised a five-minute standardized rationale for treatment; control subjects were given only basic relaxation instructions. Following the training session, both groups were instructed to practice the exercise daily during the subsequent week. At the conclusion of the week, retrospective self-reports of adherence were obtained. The limited data provided by these investigators indicate no significant effect of treatment on adherence, and average adherence rates of 4.5 and 5.12 practice sessions for the machine and retrospective self-report measures, respectively. There was also no relationship between level of adherence and changes on the state anxiety measure used.

An extensive amount of work on adherence to relaxation practice has been conducted by Hoelscher, Lichstein, and Rosenthal (1986; 1984), Lichstein and Hoelscher (1986), and Hoelscher (1987). They developed the Relaxation Assessment Device -- a device similar to but less sophisticated than the Taylor et al. (1983) tape recorder -- consisting of a relaxation tape sealed in the tape recorder with a cumulative stopwatch secreted in the battery compartment that is activated by depressing the play button. It records the cumulative time that the tape has been used.

Lichstein and Hoelscher (1986) taught progressive muscle relaxation in four once-weekly small group sessions to 12 hypertensive patients and 12 patients who met DSM III criteria for generalized anxiety disorder. Their findings revealed that the self-reports of the anxious patients overestimated RAD measured practice by 135%. This group practiced on average 4.4 times per week, for a mean adherence level of 72%. The self-reports of the hypertensives overestimated actual practice by 107%; this group had an average weekly practice rate of 7.4 sessions and a mean adherence level of 123%. In this relatively short-term study, no trend toward decay in practice rates over time was found.

Hoelscher et al. (1984) taught progressive muscle relaxation to 21 patients with generalized anxiety disorder in small groups during four once-weekly sessions and prescribed one daily practice session with the tape for the duration of treatment. Comparing self-reported practice to RAD-measured practice, they found that self-reports overestimated practice by 126%, and only 25% of the sample adhered to the prescription. For the total sample, the adherence level was 71% of the prescription. Although there were significant reductions in anxiety between pre- and post-treatment and a significant correlation between RAD-measured practice and reductions on the neuroticism scale of the Eysenck Personality Questionnaire, there was no relationship between adherence and changes in anxiety. Self-efficacy ratings (taken only at the third week of treatment) were moderately correlated with self-reported practice (r = .65), but less strongly with RAD-measured practice (r = .37). However, when overestimation of self-report was controlled, the magnitude of this latter association increased sizably (r = .55). These authors suggested that self-efficacy ratings were inflated to be consistent with self-report. Although older subjects practiced significantly more frequently than younger subjects, a number of other sociodemographic variables were unrelated to adherence.

Hoelscher et al. (1986) attempted to enhance adherence to progressive muscle relaxation practice in a sample of 50 hypertensive patients randomly assigned to one of four conditions: individual training, group training, group training plus contingency contracting for home practice, and a wait-list control group. Patients were instructed to practice for the 10-week study period, during which time they completed self-report diaries and, unknown to them, had their practice recorded by the RAD which they had been given. Across conditions, self-report exaggerated actual practice by 91%, with no significant difference between conditions. Only 32% of the sample averaged one practice session per day. The group training condition had significantly higher levels of practice during the four weeks of treatment than the other two conditions, and subjects in this condition practiced more than the contingency contracting group during the 6 weeks following treatment. There was no significant difference in practice between the group and individual treatment conditions during the six week post-treatment period. There were significant correlations of moderate magnitude between self-efficacy ratings (taken pre-treatment and after weeks 1 and 5 of practice) and RAD-measured practice for the two weeks following each assessment (r = .42, .59, and .54, respectively). Age and pre-treatment beliefs about treatment efficacy were moderately correlated with RAD adherence scores (r = .48 and .44, respectively). The three active treatments had significantly lower systolic and diastolic blood pressure than the wait list controls but did not differ from each other. The patients who did practice once a day had significantly greater reductions in systolic blood pressure than those who were non-adherent.

In this study subjects were not actually away from treatment for the six weeks following treatment, as they had to return weekly to have their tape recorders reset and hand in their practice diaries. Patients who reported practicing to the prescribed level were reinforced, those who did not were reminded of the prescription. The requirement of filling out a self-report diary and delivery of reinforcement probably acted as an adherence-enhancing strategies, so these adherence rates may not reflect maintenance of relaxation practice behaviour free of intervention. These studies also made use of a money deposit strategy in an attempt to reduce attrition. Consequently, there may be some sampling bias as the sample may have comprised patients who were more motivated to take part to begin with and who agreed to the money deposit. The self-efficacy ratings in the two studies which used them were not taken weekly throughout treatment and were assessed against adherence data for a subsequent two-week period. This appears inconsistent with Bandura's (1982a) model, which suggests that percepts of efficacy are most predictive of proximal behaviours.

These investigators note that self-efficacy judgments may be influenced by social desirability in order to be consistent with exaggerated self-reported practice levels. They suggest that study designs attempt to minimize demand characteristics that might promote this response tendency.

3.2.4 Determinants of Adherence

Haynes (1979) noted that more than 200 factors have been studied in attempts to determine their relationship to adherence. These can be broadly grouped into factors comprising patient characteristics, treatment regimen characteristics, disease/symptom features, practitioner-patient relationship variables, and service delivery variables.

There is no one pattern of patient characteristics predictive of non-adherence (Meichenbaum & Turk, 1987; Dunbar & Agras, 1980; Haynes, 1979; Masek, 1982; Masur, 1981). Sociodemographic variables such as age, sex, socioeconomic status, marital status, race, religion, intelligence, and income have generally not been found to correlate with non-adherence. Attempts to uncover relationships between patient personality traits and adherence have been unsuccessful. With the exception of extreme disturbances of functioning and motivation, personality variables are not significant predictors of non-adherence (Stunkard, 1981; Dunbar & Agras, 1980; Masur, 1981). Studies that move beyond measuring traits to variables such as illness-relevant cognition and beliefs about treatment find stronger relationships (Meichenbaum & Turk, 1987).

Disease factors per se have emerged as being relatively unimportant determinants of adherence when studied in isolation. The variables studied in this area include severity of disease, severity of symptoms, and previous experience with disease. Low adherence rates are consistently reported when an illness or health problem is chronic and non-life threatening. Both clinical improvement and increasing symptoms have been associated with lower rates of adherence. Yet, patients' perceptions of disease factors (such as perceived susceptibility, perceived severity, and perceived control over health behaviours) have been correlated with adherence (Haynes, 1979; Becker & Rosenstock, 1984; Leventhal et al., 1984; Janis & Rodin, 1979; Becker, Maiman, Kirscht, Haefner, Drachman, & Taylor, 1979). Perhaps, for adherence to occur, symptoms must be at a sufficiently high level to arouse the need for adherence, must be perceived as being resolvable/acute, and remedial action must effect a proximal salient reduction in symptoms (Turk et al., 1986).

Several characteristics of the prescribed regimen reliably predict non-adherence. Low adherence rates are associated with treatments of increasing duration and complexity. Across studies the range of adherence for long-term treatment ranges from 41% to 64% with a mean of 54% (Sackett & Snow, 1979). An inverse relationship exists between the amount of behavioural change required by the therapeutic programme (its complexity) and adherence. Treatments involving increasingly significant lifestyle changes (e.g., giving up old habits, learning new behaviour patterns) have lower adherence rates than those involving taking medication, and adherence drops when the regimen involves multiple behavioural and decision-making requirements or when treatment is prophylactic (Meichenbaum & Turk, 1987; Haynes, 1979; Masur, 1981). Rejeski, Moreley, and Ribisl (1983) found that 65% of the explained variance for non-adherence in a cardiac rehabilitation programme could be accounted for by specific characteristics of the programme.

Patient knowledge about an illness has not been consistently correlated with adherence and no significant improvement in adherence has been related to simply providing increased information to patients. Studies of medication adherence, however, have shown that specific knowledge of elements of the regimen is associated with better adherence in the treatment of short-term acute illness (Kirscht & Rosenstock, 1979). The clarity with which diagnostic and treatment advice is presented to patients has been correlated with adherence, but not in the case of chronic illnesses and long-term regimens (DiMatteo & DiNichola, 1982). Clinician characteristics such as warmth, empathy, and providing continuity of care also appear to be positively correlated with adherence (Dunbar & Agras, 1980).

Results of a recent structural modelling study indicate that the combination of an internal locus of control for health, greater knowledge of the treatment regimen, and higher levels of social support were significant determinants of adherence to a regimen of anti-hypertensive medication. On the other hand, such factors as satisfaction with service provision, patient-provider communication, and lifestyle disruption caused by treatment did not have significant associations with adherence (Stanton, 1987). The influence of specific determinants of adherence varies across types of illnesses and treatment regimens. Adherence appears to be influenced by numerous interactive factors including aspects of the treatment regimen and patient cognitions relevant to perceptions of health risk, beliefs about the efficacy of treatment, course, prognosis, and degree of personal controllability. The search for consistent patterns of determinants has yielded some helpful data on the dimensions of regimens, the nature of the treatment relationship, and the importance of cognitive variables in achieving a more complete understanding of adherence.

3.2.5 Behavioural Intervention to Increase Adherence

Adherence-enhancing interventions have been aimed at a number of the determinants cited earlier. Modifying the practitioner-patient relationship via such communication interventions as increasing practitioner empathy and creating a patient-oriented interview has enhanced adherence (Hanson, 1986; DiMatteo & DiNichola, 1982). Simply providing more information about an illness or treatment tends to be ineffective, yet including such components as communicating aspects of the regimen comprehensively in non-technical terms and helping patients integrate new tasks into their daily routines facilitates adherence (Meichenbaum & Turk, 1987).

Behaviour modification interventions have also been utilized. These strategies have proven effective for short-term regimens. However, many studies are uncontrolled, have small sample sizes or are single-case studies, and behaviour modification techniques have not been successful in promoting long-term adherence (Southam & Dunbar, 1986; Gerber, 1986; Butler, 1983; Epstein & Cluss, 1982). Meichenbaum and Turk (1987) summarize the self-regulatory, stimulus control, and contingency management strategies applied to adherence as including "self-monitoring, goal setting, corrective feedback, behavioural contracting, commitment enhancement and reinforcement procedures" (pp. 149-150). All appear capable of increasing adherence, in at least the short term, for diverse regimens involving medication use (Epstein & Cluss, 1982), cardiac rehabilitation modalities (Baile & Engel, 1978; Oldridge & Jones, 1983), weight reduction (Brownell & Jeffery, 1987), caloric intake (Zegman & Baker, 1983), smoking cessation (Glasgow & Lichtenstein, 1987), dietary adherence (Cummings, Becker, Kirscht & Levin, 1981), and diabetes control (Shafer, Glasgow, & McCaul, 1982).

Behavioural techniques applied to adherence problems are most efficacious when used as components of multi-modal strategies including, in addition to behavioural components, individualized tailoring of the treatment programme, encouraging social support, reorganizing features of the service delivery environment, and increasing accessibility of services (Southam & Dunbar, 1986; Martin & Dubbert, 1982; Masur, 1981; Haynes, 1982). The key to successful intervention involves maximizing patient involvement in the context of a collaborative treatment relationship (Meichenbaum & Turk, 1987). These diverse findings have been borne out in a recent meta-analytic study on adherence intervention (Posavac, Sinacore, Brotherton, Helford, & Turpin, 1985).

A major goal of the behavioural strategies noted above is to encourage patients' active participation in the intervention by focusing on task-related behaviours. One reason for the failure of behavioural techniques to enhance long-term adherence (or maintenance of behaviour change) may be that insufficient attention is given to helping patients make the cognitive changes necessary to support behaviours which must be carried out over the longer term. To facilitate behavioural self-regulation, Cameron (1978) believes that the therapist should work to instil appropriate expectations for the rate of change associated with treatment, help patients anticipate failures and setbacks, and help patients attribute positive changes to personal capability instead of external factors.

Therapist input may be essential for behaviour change during skill-training phases of treatment. However, the maintenance of behaviour change appears to require unassisted effort and self-regulation on the part of patients, and these factors depend on processes of cognitive change (Meichenbaum & Cameron, 1983; Krantz, 1980). If such factors were systematically addressed in risk reduction interventions, an increase in patient involvement and adherence should be observed.

There is some empirical support for this perspective. Marlatt (1985) and Brownell, Marlatt, Lichtenstein, and Wilson (1986) helped patients anticipate and plan responses to episodes of relapse via a variety of self-monitoring and skill-training procedures, and by correcting dysfunctional attributional frameworks and self-labeling. In a controlled intervention study of adherence to an exercise programme, Belisle, Roskies, and Levesque (1987) found significantly better short and long term adherence for their experimental group, which received an intervention based on Marlatt's relapse prevention model emphasizing cognitive determinants of relapse. However, the treatment accounted for only a small proportion of the variance in the maintenance of behaviour change.

3.2.6 Theoretical Models of Adherence Behaviour

The lack of a general theoretical model of adherence behaviour has resulted in fragmented efforts to deal with the problem (Haynes, 1982; Meichenbaum & Turk, 1987; Stunkard, 1981). Attempts to modify non-adherence are often based on generic principles relevant to behaviour change rather than on an integrative understanding of its determinants. Thus, interventions are based on theories of behaviour change, but are not rooted in a larger theoretical framework which incorporates the determinants of health behaviours.

A number of contemporary authors have described models relevant to adherence. In this section the Health Belief Model (Becker, 1979), Marlatt's (1982) Relapse Prevention Model, Janis' (1984) work on health-behaviour decision-making, the Leventhal et al. (1984) Self-Regulation model, and the contributions of cognitive social-learning theory presented by Meichenbaum & Turk (1987) and Turk et al. (1986) are discussed.

The influence of patient beliefs on adherence has been addressed through research using the Health Belief Model. Originally developed to account for decisions to engage in protective health behaviours (Becker, 1979; Becker et al., 1979), it has recently been revised (Becker & Rosenstock, 1984) to include variables thought relevant to adherence and contains such factors as perceived susceptibility to a disease or its consequences, seriousness of the impact of the disease, treatment efficacy beliefs, appraisal of the costs/barriers/inconveniences incurred following a treatment regimen, general health motivation, satisfaction with the provision of care, relationship with the practitioner, susceptibility to illness recurrence, and nature of the treatment regimen (Becker & Rosenstock, 1984).

Tests of the model have predominantly employed cross-sectional or retrospective designs and, taken together, results are not supportive of the model. Across studies different components of the model have been related to similar health behaviours, suggesting measurement or construct validity problems, and model components typically account for little explained variance.

Similar results have been obtained in prospective studies; strong correlations have not been found between health beliefs at the outset of treatment and subsequent adherence. For example, pre-treatment health beliefs did not predict medication adherence in a sample of hypertensives at six month follow-up, whereas 52% of the variance in adherence was explained by patients' predictive estimates of adherence (Taylor, 1980). Lindsay-Reid and Osborne (1980) found that health beliefs accounted for only 9% of the variance in adherence in a sample of exercise programme participants. Yet, in some studies, health beliefs have been correlated with concurrent adherence (DiMatteo & DiNichola, 1982; Cummings, Becker, & Maile, 1981; Becker et al., 1979). Thus, measurement might better be focused on beliefs at multiple timepoints over the course of treatment in order to adequately understand the phenomenon.

Overall, consistent support has not emerged for the Health Belief Model over a range of health behaviours. An excellent critical review is provided by Norman (1986), who concludes that "on the whole health beliefs are only weak predictors of behaviour. The expected relationship between health beliefs and subsequent behaviour is more frequently absent than present" (p. 51). The Health Belief Model may be more helpful as a heuristic for understanding why a patient may or may not adhere at a given point in time rather than for predicting global adherence (Cluss & Epstein, 1985).

The Health Belief Model stresses cognitive factors underlying health behaviour, but research to date has not sufficiently clarified the point in the decision-making process at which health beliefs are important. In addition, the model omits variables relevant to specific adherence task behaviours. Most recently, supporters of the Health Belief Model have discussed the importance of self-efficacy as a mediating variable in the model (Stretcher, DeVellis, Becker, & Rosenstock, 1986).

Marlatt's (1982, 1985) model of relapse is rooted in social-learning theory and emphasizes cognitive factors in the decision to maintain or relapse from newly acquired abstinence behaviours in addiction populations. Marlatt postulates that when an individual is confronted with a situation of high risk for relapse, there are two possible outcomes: the individual can make a coping response leading to an increased sense of self-efficacy and a decreased probability of relapse; conversely, failure to make a coping response leads to decreased self-efficacy and positive outcome expectancies for the initial effects of indulgent behaviour, setting up an initial experience of relapse. This leads the individual to experience dissonance and then to self-attribute loss of control, leading to an increased probability of total relapse. Research to date, in smoking cessation and treatment of alcoholism, provides some validity for the components of the model (Condiotte & Lichtenstein, 1981; Marlatt, 1982; Brownell et al., 1986).

Janis (1984) offers another cognitive approach proposing that health behaviours are the result of decision-making processes at choice points triggered by the occurrence of a physical problem. Decision-making ability is thought to be influenced by the stressors encountered by the individual. To the extent that the patient feels that the internal and external environments are predictable and that outcomes will be positive, appropriate action will be taken. The degree of perceived self-competence and power will facilitate or impede the probability of taking a health action by impacting at one of the stages of the decision-making process. This model has yet to be fully operationalized for adherence research but has some support in the social psychological literature.

A recent formulation of Self-Regulation Theory relevant to health behaviour (Leventhal et al., 1984) proposes that patients create personal representations of health threats and act according to those representations. While health behaviour is directed by the representation, action depends on three factors: 1) the belief that one can manage the environment and one's own behaviour; 2) the individual's repertoire of coping responses; and 3) the ability to relate oneself to the problem situation, test responses and alternatives, and accurately appraise outcomes. No research has yet tested the model in terms of adherence, so its validity remains to be evaluated. On a theoretical level, this model has some similarity to the other three models in proposing that when an individual's percepts of self-regulatory capacities are insufficient to meet health demands, new behaviours will fail to be engaged in or maintained.

Turk et al. (1986) and Meichenbaum and Turk (1987) attempt to explain non-adherence using a model that is based in the reciprocal determinism of cognitive social learning theory. The model specifies four interdependent factors: knowledge and skills, beliefs, motivation, and actions. Deficits in any one factor can result in non-adherence. Briefly, patients need accurate knowledge about their health problem and the self-care behaviours involved in treatment, the adherence requirements of the regimen and the conceptual basis of the self-care behaviours. In addition to holding a broad range of beliefs regarding the treatment regimen, the health problem, and the practitioner, patients have self-referent beliefs regarding their competence to carry out self-care behaviours. The motivation required to sustain adherence behaviour requires sufficient self-reinforcement based on accurate internal attribution of success. For patients to perceive carrying out the behaviour as being reinforcing, results must be seen to be contingent on personal action, positive results must have a reinforcement value, and negative results must be experienced not as failures but as an indication to reflect on and modify behaviour.

Episodes of action are based on attending to relevant cues for action and the information processing functions which subserve the recall, selection and evaluation of behavioural options. Action over time is dependent on accurate appraisal of success and failure feedback from attempts at self-care. Because adherence to self-care regimens often requires that new, time-consuming behaviours be carried out consistently over time and in varied situations, negative cognitions regarding the regimen can develop and interfere with action. Given that the patient must be able to act despite inhibiting influences in the external environment, cognitive structures and processes relevant to self-care and the relationship between self-care behaviours and outcomes are crucial for adherence (Meichenbaum & Turk, 1987).

Cognitions regarding the treatment itself and dimensions of the therapeutic process are thought to be important factors mediating treatment effectiveness. Negative cognitions regarding the efficacy of treatment and/or one's capacity to change reduce the likelihood of a positive outcome due to "over-interpretation of slow progress and setbacks and discounting of successes, all of which in turn reduce [his] success and thus exacerbate the negative self-monologue" (Cameron, 1978, pp. 244-245).

Patients embark on treatment with a variety of beliefs and expectations about what is wrong with their health, the meaning of their illness, its cause, course, and prognosis, and their ability to carry out the requirements of treatment. These cognitions may be critical mediators of adherence (Leventhal et al., 1984; Turk et al., 1986). Should these cognitive variables be influenced by inadequate or incorrect information or cognitive distortions, adherence may be subverted.

A component shared by the models described above is the role assigned to self-referent cognition in determining adherence. Marlatt (1985; 1982), Janis (1984), Leventhal et al. (1984), and Turk et al. (1986) consider Bandura's (1977, 1982a, 1982b, 1982c) construct of self-efficacy -- an individual's conviction that he or she can successfully execute the behaviours that a situation requires -- to be a central mediating variable in adherence. This theoretical point of convergence, combined with empirical data on adherence determinants, may provide the nucleus of a general theory of adherence behaviour.

3.2.7 Self-Efficacy Theory and Adherence

Self-Efficacy Theory, Research, and Intervention

Originally hypothesized to account for the mechanism of change in behaviour therapy (Bandura, 1977), self-efficacy appears quite relevant to a theory of adherence behaviour. Beginning with the premise that self-referent thought mediates behaviour, Bandura (1977) theorized that percepts of self-efficacy, defined as, "...individuals' judgments of their capabilities to organize and execute courses of action required to attain designated types of performances", have a central role in behaviour change and should therefore predict the initiation and maintenance of new behaviours.

Efficacy judgments vary on three dimensions: level of task difficulty or complexity, strength of belief in task competence across levels, and generality over domains of functioning.

Bandura (1982b) proposed that an individual's expectations of personal efficacy influence the initiation of coping behaviour, the amount of effort that will be expended to maintain coping behaviour, and the length of time such behaviour will be maintained in the face of internal and external obstacles. There are several sources of efficacy information and the processing of this information is subject to judgmental processes that may be faulty, resulting in relevant information being ignored or misweighed.

Accurate appraisals of capability in relation to a specific task are important in adherence, because both overestimation of self-efficacy (leading to less effort expenditure and consequent failure) and underestimation (leading to avoidance behaviour) can impede the learning and use of new health behaviours. Discrepancies between self-efficacy and action arise most frequently when individuals misjudge their efficacy.

These errors are due to insufficient previous task experience, or to distorted appraisal processes (based on errors in perception, processing or retrieval of efficacy-relevant experiences). Both types of judgmental errors impede accurate self-appraisal. Learning and maintaining new behaviours is more difficult when self-efficacy is misjudged.

Self-efficacy theory predicts that a behaviour will be initiated and maintained to the extent that there is a sufficiently strong belief that one can perform the actual behaviour (self-efficacy) given adequate task-relevant skills and motivation. An individual with a high level of self-efficacy in relation to a specific task will be more likely to both attempt it and persist in carrying it out than an individual with a low level of self-efficacy. Tasks believed to be beyond one's capability will be avoided (Bandura, 1982b, 1986a, 1986b).

A given judgment of self-efficacy is arrived at through four primary sources of information. The most influential source is enactive attainment based on actual mastery experiences by which successes and repeated failures, respectively, raise and lower self-efficacy given adequate effort and at least neutral environmental conditions. Vicarious experiences can also influence self-efficacy appraisals, as viewing similar models can raise efficacy percepts in observers when limited experience with a task makes evaluation of personal competence difficult. Verbal persuasion can enhance self-efficacy to the extent that it may promote the effort and skill development necessary for strong efficacy appraisals. Persuasion alone does not create enduring increases in self-efficacy in situations which require successful enactive experiences. The fourth source is information derived from appraising physiological state indicators such as autonomic nervous system arousal, fatigue, pain, etc. Such information serves to inhibit or facilitate performance (Bandura 1986b).

Several factors can affect the strength of the relationship between self-efficacy and action. The person must have the necessary subskills required for the task, and underappraisal of efficacy can inhibit the development of essential subskills. Even with sufficient levels of self-efficacy and basic subskills, an activity may not be performed if incentives are lacking or there are external constraints.

Self-referent thought appears in a number of conceptual frameworks attempting to explain human behaviour; however, the constructs and processes by which they exert influence differ.

For example, the construct of self-concept is an integrated awareness of self constructed from direct experience and consensual validation and related self theories focus on global self-image as the unit of analysis. Self-efficacy differs in that it is assumed to vary across tasks and contexts. Similarly, self-efficacy is differentiated from self-confidence, self-esteem, or locus of control (Saltzer, 1982). It is a situation-specific appraisal of behavioural capability, not a general attribute.

Expectancy-value theories predict performance from beliefs that a particular behaviour will have an outcome that is valued (Maddux, Norton

& Stoltenberg, 1986). In self-efficacy theory, self-efficacy and outcome expectancy are conceptualized as distinct variables, both influencing behaviour. Self-efficacy is the individual's appraisal of how well he or she can organize and execute courses of action required to deal with prospective situations, whereas an outcome expectancy refers to the probability that once a behaviour is performed certain outcomes will follow (Bandura, 1982c). Of the two expectancies, Bandura suggests that self-efficacy is the more central and proximal determinant, and that outcome expectancies are partly dependent on self-efficacy. One can believe that a certain behaviour may lead to a desired outcome yet fail to act on that expectancy because of doubts about actual ability to carry out the behaviour (Bandura, 1986b). The utility of self-efficacy expectancies in predicting behaviour has been established in social psychological, clinical and analogue studies over the past decade (Bandura, Adams & Beyer, 1977; Bandura, Adams, Hardy & Howell, 1980; Gauthier & Ladouceur, 1981; DiClemente, 1986; Stanley & Maddux, 1986a; 1986b; Hill, Smith & Mann, 1987; Locke, Frederick, Lee & Bobko, 1984; Bandura & Cervone, 1983; Bandura & Schunk, 1981). Experimental studies attempting to manipulate self-efficacy support the importance of self-efficacy as a predictor of behaviour (Bandura & Adams, 1977; Bandura, Reese & Adams, 1982; Davis & Yates, 1982; Altmaier, Leary, Halpern & Sellers, 1985; Maddux et al., 1986; Maddux, Sherer & Rogers, 1982).

In spite of these supportive results, much of the self-efficacy research has failed to include alternative cognitive variables (such as outcome expectancy), that might well account for behaviour change (Maddux & Stanley, 1986). This has fueled methodological and construct validity controversies (Teasedale, 1978; Kazdin, 1978; Eastman & Marzillier, 1984; Marzillier & Eastman, 1984; Eysenck, 1978; Tryon, 1981; Kirsch, 1986, 1985; Tryon, 1982) which recent research has addressed.

Regarding methodology, behavioural performance appears unaffected by disclosing self-efficacy judgments, and private versus public voicing of self-efficacy has no effect on the congruence of self-efficacy with overt behaviour. Assessing the impact of making self-efficacy judgements under conditions of high and low social demand, Telch, Bandura, Vinciguerra, Agras, and Stout (1982) reported that social demand does not increase the congruence between self-efficacy and behaviour, and in fact tends to decrease it. This finding has also been reported by Gauthier & Ladouceur (1981). The Chi-square and microanalytic correlational data analysis originally used to determine relationships between self-efficacy and behaviour have come to be replaced by more appropriate statistical procedures (Lee, 1985; Cervone, 1987; Kirsch & Wickless, 1983; Kirsch, 1980).

Regarding construct validity, studies which found self-efficacy and outcome expectancy highly intercorrelated appear to have confounded their measurement (Manning & Wright, 1983; Lee, 1984a). Recent studies have been successful in showing the relative independence of self-efficacy and outcome expectancy and in selectively manipulating the two variables. Maddux et al. (1982) found that raising outcome expectancy significantly increased behavioural intentions toward an assertive behaviour while enhanced self-efficacy did not. In their study, the outcome-expectancy manipulation also affected self-efficacy ratings, as subjects who believed the behaviour would have positive outcomes had higher self-efficacy than those who believed behavioural performance and outcome were unrelated. Maddux et al. (1986) view self-efficacy as a refining component of expectancy-value theory, which has tended to focus on outcome expectancy and outcome value. Their work on the inter-relationships between self-efficacy, outcome expectancy and outcome value suggests that the three variables can be measured independently and that self-efficacy and outcome expectancy can be selectively manipulated. They observed a significant main effect for outcome expectancy, but not for self-efficacy, on behavioural intentions. Both self-efficacy and outcome expectancy had significant moderate correlations with behavioural intentions and outcome value. Hierarchical multiple regression revealed that each variable made a significant contribution to the prediction of behavioural intention when added to combinations of the other two, with outcome expectancy yielding the largest independent increment. These findings suggest that self-efficacy may not always be the most important predictor of behaviour, and indicate the importance of measuring related cognitive variables in order to understand their inter-relationships and respective contributions to behaviour.

Self-Efficacy Intervention

Irrespective of its efficacy, any treatment regimen can be subverted by inaccurate self-referent thought concerning one's ability to perform prescribed actions. Individuals who have the necessary skills, but whose percepts of self-efficacy are low in relation to a specific task, appear unable to initiate and maintain behaviour change (Marlatt, 1982). Krantz (1980) has asserted that treatment aimed at modifying cardiac patients' inaccurate self-appraisals of functional capacity and abilities will lead to new behaviours important for recovery.

A number of authors have described approaches for self-efficacy intervention. Bandura (1982a, 1982b) has stated that performance accomplishments (e.g., resulting from direct exposure, participant modelling, in vivo desensitization) are the most salient sources of self-efficacy information. This is due to the potency of self-observation of improved performance and the awareness of having new coping skills. Verbal persuasion results in weaker changes in expectancies. However, for efficacy information to have an impact on efficacy expectancies, the individual must be able to process the information accurately and be able to add new information to the schema of his or her behavioural efficacy in relation to a specific task.

Goldfried and Robins (1982, 1983) and Newman and Goldfried (1987) have described procedures to facilitate the processing of efficacy information in the clinical situation, the goal being to bring about lasting change in the individual's self-schema. Intervention is at the level of the cognitive processes and structures involved in making judgments of personal efficacy and takes into account attributional styles, generalized beliefs about the self, sensitivity to situational information, and the individual's self-schema. The therapist works to 1) aid the patient in discriminating between past and present behaviours; 2) help the patient view changes from both a subjective and objective perspective; 3) help the patient recall past successes; and 4) help the patient align expectancies, anticipatory feelings, behaviours, objective consequences and subsequent evaluations. This procedure served as the basic framework for the experimental intervention of this study.

Self-Efficacy Theory, Health Behaviours, and Adherence

Correlational studies of self-efficacy and adherence consistently report strong relationships between self-efficacy and a variety of adherence target behaviours (O'Leary, 1985; Strecher et al., 1986). Self-efficacy and relapse from smoking cessation had moderate significant negative correlations at three and six month follow-up but not at one year (McIntyre, Lichtenstein, & Mermelstein, 1983). A number of other studies have also found that high self-efficacy predicts longer abstinence

(Condiotte & Lichtenstein, 1981; DiClemente, 1981; DiClemente, Prochaska, & Gibertini, 1985; Prochaska, Crimi, Lapanski, Marel, & Reid, 1982). Strecher et al. (1986) reported an interaction between self-efficacy and outcome expectancy as subjects high on both had higher rates of smoking reduction than subjects with high outcome expectancy and low self-efficacy. Maddux & Rogers (1983) report a similar interaction regarding intentions to quit smoking. Chambliss & Murray (1979) found that the main effect of a self-efficacy manipulation to reduce smoking depended on an interaction effect between self-efficacy and locus of control; the self-efficacy intervention was effective only among subjects with an internal locus of control, suggesting that self-efficacy is a determinant only to the extent that an individual believes personal action controls health outcomes.

Studies assessing self-efficacy as a determinant of weight loss are consistent with the results of the smoking cessation work. Subjects with high pre- and post-treatment self-efficacy lost significantly more weight than those with low self-efficacy (Weinberg, Hughes, Critelli, England, & Jackson, 1984). Mitchell & Stuart (1984) observed that pretreatment self-efficacy predicted attrition and weight loss during treatment. Similar findings were reported by Bernier & Avard (1986) who added that post-treatment self-efficacy was significantly associated with weight loss at six-week and six-month follow-up. One study found that self-efficacy predicted weight loss in subjects with an internal locus of control, but not for those with an external locus of control (Chambliss and Murray, 1979).

Dialysis patients who adhered to fluid intake restrictions had higher levels of self-efficacy than those who were non-adherent; however, past adherence was the strongest predictor (Rosenbaum & Smira, 1986). In this study, patients with high self-efficacy scores were those who attributed past adherence success to personal effort. In their study of a similar sample, Witenberg, Blanchard, Suls, Tenner, McCoy & McGoldrick (1983) found that patients who believed they could control their health outcomes were adherent. When adherence to dental hygiene practices were assessed, self-efficacy proved to be a stronger predictor of adherence than severity of perceived health threat and outcome expectancy (Beck & Lund, 1981).

For cardiac patients in an exercise rehabilitation programme, self-efficacy was a better predictor of the intensity and duration of physical activity than peak treadmill heart-rate (Ewart, Taylor, Reese, & DeBusk, 1983). In a sample of respiratory patients, Kaplan, Atkins, and Reinsch (1984) found self-efficacy to be a better predictor of adherence to an exercise programme than locus of control. A prospective study using subjects from an exercise programme identified both pre-treatment self-efficacy and outcome expectancy as significant predictors of dropout, but found that self-efficacy was a stronger predictor (Desharnais, Bouillon, & Godin, 1986). An interesting finding in this study was that dropouts could be reliably predicted by the combination of high outcome expectancy and low self-efficacy. Bandura (1982a) and Davis and Yates (1982) have also reported performance deficits in subjects with this expectancy-efficacy pattern, and Lee (1984b) suggests it is important to increase self-efficacy and outcome expectancy simultaneously to facilitate behaviour change.

The only studies addressing the role of self-efficacy in adherence to relaxation practice (Hoelscher et al., 1984, 1986) found that self-efficacy was significantly correlated with objectively measured adherence but only when overestimation of self-reported practice was statistically controlled. These studies were only secondarily interested in self-efficacy, did not attempt an experimental manipulation of self-efficacy, and did not measure any other potential cognitive mediators of adherence. Stanley and Maddux (1986b) observed that both self-efficacy and outcome expectancy predict intentions to take health-enhancing actions, with outcome expectancy being the stronger of the two. However, combining the two variables in a regression equation added significant predictive strength.

Although most correlational studies find self-efficacy to be a stronger predictor of adherence than outcome expectancy or locus of control (O'Leary, 1985), the data from controlled experimental studies indicate such variables may interact with self-efficacy to produce behaviour change. Brewin and Shapiro's (1979) generalization that self-efficacy may prove a better predictor of treatment effectiveness than global outcome expectancies appears only partly true. The centrality of self-efficacy as a predictor of adherence can be questioned in light of the findings cited here. When measured in conjunction with other cognitive variables, the primacy and predictive strength of self-efficacy varies. This suggests that a more complete understanding of adherence requires the simultaneous assessment of a number of cognitive variables, at least self-efficacy and outcome expectancy. Most of the studies discussed in this section have been correlational, or have relied on main-effects analyses. It would be more theoretically illuminating to employ experimental designs and structural modelling procedures to address the mediational role of self-efficacy in adherence.

3.3 Summary

Relaxation training is a cornerstone of stress management programmes in cardiac rehabilitation. The effectiveness of these programmes varies, and patient adherence to relaxation practice appears to be less than optimal. Recently, Turk et al. (1986), Marlatt (1985, 1982), Janis (1984), Leventhal et al. (1984), and Becker et al. (1979) have proposed models attempting to explain non-adherence. These models share a focus on cognitive behavioural factors and appear conceptually linked to Bandura's (1977, 1982a, 1982b) self-efficacy theory. When applied to adherence, this theory suggests that high percepts of self-efficacy are predictive of initiating and maintaining adherence, while low percepts of self-efficacy predict non-adherence.

Correlational data revealing direct relationships between self-efficacy and adherence support this contention. However, experimental studies implicate other cognitive variables, such as outcome expectancy, as contributing to adherence behaviour, both alone and in combination with self-efficacy. The theoretical and research literature suggest that interventions to facilitate adherence may be improved by focusing directly on enhancing self-efficacy.

An experimental study attempting to raise self-efficacy towards prescribed relaxation practice and to evaluate its role as a determinant or mediator of adherence in comparison with outcome expectancy appears very timely, and is the subject of the present research. The primary purpose of this experimental study was to increase patient's self-efficacy in relation to prescribed progressive muscle relaxation practice in order to determine the role of self-efficacy in adherence behaviour. However, as Haynes (1982) notes, it is important to include some form of outcome measurement in a adherence study. Although this was not a treatment efficacy study, the target of treatment was to reduce anxiety which is believed to be both a risk-factor and a common sequelae of heart disease. The impact of the interventions on this secondary outcome was operationalized in terms of state anxiety.

Non-adherence is conceptualized here as arising from low self-efficacy regarding one's capability to engage in prescribed relaxation practice. To provide a more rigorous test of the central theoretical question of the role of self-efficacy in adherence, outcome expectancy was also assessed in a design which allowed causal interpretation of their roles in adherence.

Male cardiac patients referred to a stress management programme at the Cardiac Prevention and Rehabilitation Centre, University of Ottawa Heart Institute were randomly assigned to a self-efficacy enhancing stress management treatment group or a standard stress management control group. Subjects were compared on levels of self-efficacy, outcome expectancy, adherence, and anxiety during treatment, at post-treatment and at a follow-up timepoint. The study's objectives and hypotheses are described in the next section.

4. OBJECTIVES AND HYPOTHESES

Objective 1: Effects of treatment on self-efficacy

To determine whether patients who receive the experimental intervention designed to increase percepts of self-efficacy in relation to progressive muscle relaxation practice have higher levels of self-efficacy and/or outcome expectancy during treatment relative to patients in the control condition.

Hypothesis 1-A: at the pre-intervention time-point there will be no significant difference in self-efficacy scores between the experimental and control conditions. Following the initiation of the experimental intervention, patients in the experimental condition will have significantly higher self-efficacy scores than controls at each time point for the remainder of treatment.

Hypothesis 1-B: there will be no significant differences between conditions on outcome expectancy at any time point.

Objective 2: Effects of treatment on adherence

To determine whether patients who receive the experimental intervention practice the prescribed relaxation exercise more frequently than patients who receive the standard relaxation intervention as measured by percentage of adherence to prescription using weekly relaxation practice scores provided by the Relaxation Practice Monitor as the dependent measure.

Hypothesis 2: adherence scores for the pre-intervention week of practice will not be significantly different for experimental and control conditions. The experimental group will have significantly higher adherence scores than the controls for each of the subsequent seven weeks of prescribed practice following the baseline week.

Objective 3: Effects of treatment on anxiety

To determine whether the experimental intervention results in lower scores on the state anxiety scale of the State Trait Anxiety Inventory (STAI-S) relative to the standard intervention.

Hypothesis 3: there will be no significant differences between the experimental and control conditions on pretreatment STAI-S scores. The experimental group will have significantly lower post-treatment and follow-up scores on the STAI-S measure than the control group.

Objective 4: The mediational effects of self-efficacy versus outcome expectancy on adherence and of adherence on anxiety

To determine the extent to which the effects of the experimental intervention on adherence are mediated by self-efficacy as opposed to outcome expectancy; and the extent to which adherence mediates the effects of treatment and/or self-efficacy on anxiety.

Hypothesis 4-A: Primary mediation hypothesis. At post-treatment and follow-up, the effects of treatment on adherence will be largely indirect (that is, mediated by self-efficacy, rather than direct), and, outcome expectancy will not be a significant mediator.

Hypothesis 4-B: Secondary mediation hypothesis. At post-treatment and follow-up, the effects of treatment and self-efficacy (or outcome expectancy) on anxiety will be mediated largely by adherence.

5. METHOD

5.1 Subjects

The participants in this study were cardiac rehabilitation outpatients from the Heart Institute Prevention & Rehabilitation Centre (HIPRC), University of Ottawa Heart Institute. Patients were referred to the study by the cardiac rehabilitation team, following interdisciplinary assessment. Patients were referred on the basis of personal request or identification by the assessment team of at least one of the following concerns: subjective tension or anxiety, difficulty coping with psychosocial or health-related problems, skeletal muscle tension, sleep disturbance, motivational problems, irritability, impatience, hostility, restlessness, agitation, obsessional thoughts, compulsivity, tension or migraine headache, gastrointestinal disturbances, or health fears felt to be out of proportion to health risks.

The treatment was advertised as a health promotion/disease prevention stress management programme for heart patients. Those meeting the inclusion criteria were given the options of: 1) participating in a stress management programme; and then 2) participating in a study described as assessing two real but different stress management interventions. Patients were informed that should they choose not to participate in the study they would receive treatment in a separate programme.

5.1.1 Inclusion Criteria

Participants had to meet the following inclusion criteria:

1. must be an outpatient in the HIPRC and meet one of the following cardiovascular disease criteria: documented myocardial infarction, coronary artery bypass graft surgery, heart transplant, valve repair/replacement surgery, or suffering from hypertension, angina, or disturbances of heart rhythm.

2. able to participate in treatment in English

3. adequate cardiovascular functional capacity and no adverse cardiovascular effects due to the effort and energy expenditure required to perform the progressive muscle relaxation exercise.

4. no evidence of a chronic pain disorder, severe depression, or psychotic disorder (determined by psychometric screening and rehabilitation team assessment), and not on anxiolytic or antidepressant medication during the study period. Consequently, patients for whom stress management intervention was secondary to more pressing treatment needs were not recruited.

5. no damage to or weakness of muscle or connective tissue which would lead to pain while carrying out the relaxation exercise, and no neuromuscular dysfunction resulting in loss of voluntary control over skeletal muscle function.

6. no previous stress management intervention. Patients who had previously received similar interventions were excluded from the study to avoid confounding the effects of previous treatments with those provided in this study.

5.1.2 Study Sample

Participants in the study were aware that two different interventions were being provided, but did not know the true objectives of the study, which treatment condition they were in, or that their relaxation practice would be monitored. At the conclusion of the study each received a full, individual debriefing. None of the participants became aware that the tape recorders were monitoring their practice, and during debriefing none disclosed any concerns regarding this procedure.

The initial subject pool referred to the study over a period of eighteen months (September, 1986, to March, 1988) comprised 194 patients. Ten (5%) did not meet the inclusion criteria; 8 (4%) had greater than allowable levels of psychological distress and were treated individually, and 2 (1%) had insufficient comprehension of English. Another 24 (12.3%) did not accept the offer of treatment (nine stated they did not feel the need for stress management and fifteen stated the time was inconvenient). The remaining 160 patients agreed to take part in the treatment and consented to participate in the study.

Of the 160 who were randomly assigned to the treatment groups, 4 (2.5%) did not appear for the pre-treatment data collection session and dropped out of the study at that point, and another 6 (3.7%) came to the pre-treatment data collection session but dropped out of treatment immediately afterwards. Three (1.8%) patients were lost due to mortality, 3 (1.8%) patients were lost to morbidity, relaxation practice data for 2 (1.2%) patients were lost due to mechanical breakdown of the RPM's, and the data of 3 (1.8%) patients were excluded because they had tampered with the tape recorders by removing the relaxation tape. A further 19 (11.8%) failed to meet the attendance criteria of at least five of the seven treatment sessions. Overall, 39 patients (24.3%) of the sample were lost for the reasons specified above, and the final sample of 121 represented 75.7% of the initial study population of 160. Attrition appeared to be random as the experimental and control conditions were equivalent on pre-treatment and demographic variables (cf. "Results", below). The sample ranged in age from 34 to 68 years, and age was normally distributed.

5.1.3 Randomization

Whenever the pool of consenting patients who were awaiting treatment reached 16, these patients were randomized into two groups of 8, one receiving the experimental intervention and the other receiving the standard treatment. Randomization was carried out by means of a random number table and a random permuted-blocks procedure to ensure equal group size throughout the study (Pocock, 1979; Peto, Pike, Armitage, Breslow, Cox, Howard et al., 1976). A total of ten experimental and ten control stress management groups were run.

5.2 Treatment Conditions

Participants in both treatment conditions received the same stress management programme during seven consecutive once-weekly treatment sessions of one and one-half hours duration. This intervention was based on Meichenbaum's Stress Inoculation Training (Meichenbaum, 1985; Meichenbaum & Cameron, 1983) and included therapist-facilitated group work on the cognitive, behavioural and physiological dimensions of stress reactivity, the transactional model of stress and coping, and skill building in such areas as progressive muscle relaxation, changing dysfunctional cognitions, assertiveness and problem solving. General objectives were to help patients learn to self-monitor their reactions to stressors, and learn to use new and existing coping skills flexibly. Figure 1 illustrates the intervention protocols for the treatment conditions.

Insert Figure 1 about here

Intervention was identical for both conditions during sessions 1, 2, and 3. Sessions 1 and 2 were introductory and didactic in terms of building a collaborative set for treatment, reconceptualizing stress and coping in terms of the transactional process model (Lazarus & Folkman, 1984), and discussing the nature of stressors and basic psychophysiologic parameters of stress reactivity.

The abbreviated progressive muscle-relaxation exercise was taught in the third session, employing the treatment rationale and technique outlined by Bernstein & Borkovec (1973) and Borkovec & Sides (1979). At the conclusion of this session each patient was given a tape recorder with relaxation tape and a prescription to practice the exercise, using the tape, twice per day for the next week. Patients were informed that the tape recorder was to be used exclusively by them for the next eight weeks until their follow-up session, when the machines were to be returned. They were instructed that practice with the tape was an essential and integral part of the treatment programme. Patients were kept unaware that the tape recorder was monitoring their relaxation practice (cf. 5.4.3, below).

The same practice prescription was given to both conditions in sessions four through seven. In session seven, participants were instructed to continue practicing the relaxation exercise twice daily for the following four weeks, until the follow-up session.

Participants had no contact with the study team during the four weeks between session seven and the follow-up session, when they returned to discuss treatment gains, remaining areas of concern, and their experiences as participants in the study. Both conditions received the identical rationale for relaxation and the same home-practice prescription and instructions regarding practice of the relaxation exercise with the tape recorder.

5.2.1 Control Condition: Standard Stress Management Intervention

During sessions four through seven, participants in the control condition received only the generic stress management programme. This consisted of skill training and experiential in vivo and homework exercises in becoming aware of dysfunctional cognitions, cognitive errors, changing dysfunctional cognitions, problem solving and assertiveness. This intervention condition was intended to control for the effects of the different stress reduction strategies, therapist involvement, and group interactional effects on self-efficacy and adherence, and anxiety.

5.2.2 Experimental Condition: Standard Stress Management Plus Self-Efficacy Enhancement

In addition to the content of the basic stress management intervention received by the controls during sessions four through seven, participants in the experimental condition received the self-efficacy intervention. This intervention was based on the work of Goldfried & Robbins (1982, 1983) and Marlatt (1982, 1985) and designed to enhance percepts of self-efficacy in relation to the initiation and maintenance of relaxation practice by facilitating enactive mastery of the prescribed regimen. It consisted of a therapist-directed cognitive intervention designed to facilitate the processing of efficacy-relevant success and failure information. The therapists led the group members in discriminating between past and present coping behaviours, seeing change from both subjective and objective perspectives, accurately appraising and attributing success and failure experiences, recalling past successful experiences, and integrating expectancies, anticipatory feelings, behaviours and subsequent self-evaluation.

5.2.3 Treatment Manuals

To ensure consistent and appropriate application of the two interventions, the therapists delivered the interventions at each session using a standard treatment manual. A detailed outline of the generic intervention manual is provided in appendix A. The manual for the experimental intervention is provided in appendix B. Although this study did not employ formal random checks on the implementation of treatment, the importance of following the treatment manuals was emphasized to the therapists at bi-weekly supervision meetings.

5.3 Therapists

Four therapists delivered the treatment in this study. All were members of the Cardiac Prevention and Rehabilitation team at the University of Ottawa Heart Institute. Two were Masters-level social workers, one was an occupational therapist, and one was a cardiac rehabilitation nurse-clinician. Each had a minimum of 3 years of clinical experience in individual and group counselling, but had had no previous stress management training. The therapists therefore received extensive training in the interventions delivered in the study.

The training procedure for the therapists involved two phases. The first phase was didactic and skill training, covering basic principles and procedures of stress management intervention. Included were the transactional model of stress and coping, the theoretical basis for cognitive-behavioural interventions, specific intervention skills for reconceptualizing patient problems, facilitating the development of self-monitoring skills, progressive muscle relaxation, changing dysfunctional thinking patterns, assertive communication skills, and problem-solving strategies. The training manual used was Cormier and Cormier's (1985) Interviewing Strategies For Helpers: Fundamental Skills for Cognitive-Behavioural Interventions.

The second phase was in vivo training with actual stress management groups in which each therapist worked as a co-therapist with the investigator running one experimental and one control group. The therapists received individual supervision following each session. In total, each therapist received approximately 40 hours of training.

Treatment groups were led by therapist pairs who rotated between conditions with assignment counterbalanced to avoid confounding therapists with treatment conditions. The therapists were not involved in any data collection. All data were collected by a research assistant. To reduce response bias in self-report data due to demand characteristics of the therapeutic relationship, patients were specifically informed that the therapists would have no access to any data.

5.4 Variables and Measures

5.4.1 Demographics

Basic demographic information (age, marital status, educational level, employment status, and cardiac diagnosis) was gathered by a short questionnaire in which were embedded two questions: 1) "How concerned are you about your health right now?", and 2) "How well do you feel you are coping with the problems related to your heart disease?". Both questions had a 10-point Likert response option. In pilot testing on 40 cardiac rehabilitation patients, the two-week test-retest reliability of question 1 was .88 and question 2 was .76.

5.4.2 Psychological Distress

Level of psychological distress was assessed at pre-treatment with the Global Severity Index (GSI) of the Brief Symptom Inventory (Derogatis & Spencer, 1982). This is a 53-item self-report symptom inventory with nine primary symptom dimensions: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. There are three global indices: global severity index, positive symptom distress index and the positive symptom total. The GSI provides the most sensitive single indicator of the respondent's level of psychological distress. According to the BSI manual, across symptom dimensions, alpha reliabilities range between .71 and .85, and test-retest reliabilities range from .68 to .91. The global indices have high test-retest reliabilities, .80 to .90. Only the GSI score was used in the study due to high intercorrelations among the nine symptom dimensions.

5.4.3 Adherence

Adherence to the prescribed relaxation-practice regimen was measured by the Relaxation Practice Monitor (RPM), a portable tape recorder with a 20-minute relaxation tape sealed within it (Hotz & Van den Bergen, 1987). Unknown to subjects, the tape recorder contained a microelectronic circuit which measures, on a real-time basis, the extent to which the tape is played. Adherence level was calculated by dividing weekly RPM time by the amount of prescribed practice (twice per day in this study, yielding a denominator of 14). The quotient was multiplied by 100 to give a percentage-of-prescribed-practice score (Feinstein, 1974; Hoelscher et al., 1986). Only a complete 20-minute practice period qualified as an adherence episode. For example, if a patient completed the entire 20 minutes of the exercise seven times in a one-week period, his adherence score would be 50%. If a patient used the

The reliability of the RPM was established in laboratory trials by comparing its time counts of tape to a stop-watch time record over 100 trials. The reliability of the device was excellent, r = .97. Appendix C contains a detailed technical description of the RPM, circuit diagram, and discussion of measurement validity.

5.4.4 Anxiety

A clinical outcome of secondary interest to this study, in relation to the effects of both treatment and adherence, was state anxiety, as measured by the State-Trait Anxiety Inventory (Speilberger, 1983). The State-Trait Anxiety Inventory (STAI) was designed to evaluate anxiety in non-psychiatric populations. It contains two scales, each having twenty items, and utilizes a 4- point Likert-type response option. The first scale measures trait anxiety (i.e., the individual's general characteristic tendency to experience anxiety), whereas the second scale measures state anxiety (i.e., one's level of anxiety at a particular time including autonomic nervous system (ANS) arousal, feelings of apprehension and tension which are believed to comprise a transient affective state which varies in intensity over time). The test manual documents many studies of criterion and construct validity. Cronbach's alpha ranges between .86 and .92. Test-retest reliability is .86 for the trait dimension and, as would be expected, is lower for the state dimension (.54 for males, and .27 for females). Norms exist for a variety of populations, including general medical/surgical patients (Speilberger, 1983).

The measure of state anxiety was used in this study for three reasons: state anxiety has been consistently employed as an outcome measure in relaxation efficacy studies both generally (Miller, Murphy, & Miller, 1978; Lehrer & Woolfolk, 1984; Cragan & Deffenbacher, 1984), and in samples of patients with disabling medical conditions where mood-based outcomes are of interest (Lamping, 1986); state anxiety is believed to be more responsive to progressive muscle relaxation than trait anxiety; and state anxiety was felt to be the most relevant measure for this population, given the immediacy of threat associated with heart disease and the changing stressors faced by these patients over time (Baer et al., 1985).

5.4.5 Self-Efficacy

Self-efficacy is the individual's relative conviction that he/she can execute the behaviours required by a particular situation. It is measured using scales representing specific tasks which vary on levels of complexity or difficulty. The individual indicates the task levels he/she is able to perform, and the degree of confidence in his/her capability to perform the particular task levels (Bandura, 1986b). Because self-efficacy judgments are task-specific, no single scale to measure them exists. Each study attempting to measure self-efficacy must develop scale items that are appropriate to the behaviour under study (Glass & Merluzzi, 1981). The self-efficacy score is obtained by dividing the product of strength and level by the prescribed frequency of practice (Bandura & Schunk, 1981).

This study used the scale developed by Hoelscher et al., (1984) which measures percepts of efficacy in relation to performing an increasing number of home relaxation practice sessions ranging from 0-14 sessions per week (see Appendix D). The response option consists of a 10% - 100% confidence rating for each item. High scores are indicative of high percepts of self-efficacy in relation to the relaxation-practice task. In a pilot study of the measure, test-retest reliability over a two-week period for an untreated sample of cardiac rehabilitation patients was .86.

5.4.6 Outcome Expectancy

Patients' perceptions of the effectiveness and valued consequences of following a treatment or behaviour change protocol has been termed outcome expectancy. In this study, outcome expectancy was defined as the strength of the belief that learning and practicing the relaxation protocol would result in the positive outcome of symptom reduction and a concomitant increase in well-being.

The outcome-expectancy measure developed for this study (see Appendix E) was based on the work of Borkovec and Nau (1973) and

McGlynn and McDonnel (1974). It is a 6-item questionnaire employing a seven-point Likert-type response-option format, on which respondents rate the strength of their beliefs about achieving various positive health outcomes as a consequence of the relaxation technique and participating in a stress-management programme. From a sample of 40 cardiac rehabilitation patients tested in the pilot phase of this study, the two-week test-retest reliability was .79, and the alpha coefficient of internal consistency was .83. Alpha for this instrument in the present study was .80.

5.4.7 Preference for Self-Involvement in Health Care

The Krantz Health Opinion Survey (KHOS) (Krantz, 1980; Clymer, Baum, & Krantz, 1984) assesses preference for self-involvement in health care, which was considered to be a patient attribute in this study. It is a 16 item scale with a 2 point (agree-disagree) response option (see Appendix F). High scores represent favourable attitudes toward self-directed and informed treatment. It comprises two subscales: 1) Behavioural Involvement (B), which measures patient attitudes toward self-treatment and preferences for active behavioural involvement vs. passive participation in treatment; and 2) Information (I), which measures the degree to which an individual wants to be informed about his/her health status and medical decisions. Three scores are derived, one for each subscale, and a total score. Scores from the B subscale were used in this study.

Psychometric information presently available suggests that the B subscale of the KHOS is able to discriminate successfully between criterion groups of high and low self-care-oriented subjects (Krantz, Baum, & Wideman, 1980). Wallston, Smith, King, Forsberg, Wallston and Nagy (1983) confirm that the test measures two distinct factors. In terms of homogeneity, Kuder-Richardson reliability coefficients are .77, .74, and .71 for the total scale, B, and I subscales respectively (Krantz, 1980). Test-retest reliabilities were found to be .74, .71, and .59 for the total score, B, and I scales respectively over a seven-week period (Krantz et al., 1980).

5.4.8 Health Locus of Control

Health locus of control, measured by the Multidimensional Health Locus of Control Scales (MHLCS), was considered as a patient attribute in this study (Wallston et al., 1983; Wallston, Wallston, & DeVellis, 1978). The MHLCS was developed to measure individuals' beliefs concerning the locus of control over health outcomes. It comprises 18 items on three subscales: health as a function of chance factors (CHLC); health as under the control of powerful others (PHLC); and health as a function of internal control (IHLC). Respondents use a 6-point Likert-type response format ranging from strongly agree to strongly disagree.

Psychometric evaluations have revealed a statistical independence of the IHLC and PHLC subscales, a negative correlation between the IHLC and CHLC subscales, and a positive correlation between the PHLC and CHLC subscales. Alpha reliabilities for the subscales range from .67 to .76 (Wallston et al., 1983). Test-retest reliabilities have been found to be adequate for the IHLC and PHLC subscales, .58 and .76 respectively, but poor for the CHLC subscale (Winefield, 1982). Regarding predictive validity, health status has been shown to be positively correlated with IHLC ($r = .403$, $p < .001$), negatively correlated with CHLC ($r = -.275$, $p < .01$), and uncorrelated with PHLC ($r = -.055$, Wallston et al., 1978). Winefield (1982) reports support for the IHLC and PHLC factors, but found the CHLC factor to be less coherent.

5.5 Data Collection Protocol

Prior to the first treatment session, the following pre-treatment measures were administered: Patient Information Questionnaire, STAI, MHLC, and KHOS. The MHLC and KHOS data were collected to measure particular patient attributes prior to treatment, and to assess the effectiveness of the randomization procedure. The STAI, MHLC, and KHOS were re-administered at post-treatment following session seven and again at follow-up four weeks later. Of these measures, only the STAI state-anxiety data are relevant to the objectives of this thesis; data from the KHOS and MHLC at post-treatment and follow-up were collected for future possible studies.

In session 3, following the introduction to and initial training in progressive muscle relaxation, the self-efficacy and outcome expectancy measures were administered. These measures were repeated at each session until the end of treatment (sessions 4 through 7).

In accordance with the principle of "intention to treat" (Haynes, 1979), all subjects who did not attend a treatment session were followed up and asked to complete the appropriate questionnaires. These participants were retained in the data analysis if they attended at least five of the seven treatment sessions. This strategy maximizes external validity while respecting internal validity by assessing the effects of a near-maximum dose of treatment on the dependent variables.

5.6 Experimental Design

This study employed a comparative design with a treatment-element control strategy (Kazdin, 1986, 1980; Basham, 1986) to avoid confounding treatment parameters, and to control non-specific treatment factors, particularly patient expectancies. The treatment-element control strategy involved providing both the experimental and control conditions with active stress management interventions designed to be as similar as possible.

Stress management treatment goals, coping techniques taught, and the group-intervention modality were the same for both conditions, providing a basis for assuming that patients in both conditions would have similar beliefs about and expectancies for treatment.

The comparative design was chosen over a no-treatment control design because the primary research objectives involved an attempt to isolate the effects of an active component of treatment as opposed to determining the efficacy of a treatment. A less-powerful-treatment control group was not employed as its specific treatment factors are not likely to be a subset of those in the experimental group. This leaves the groups non-equivalent in terms of both demand characteristics and non-specific treatment factors (Basham, 1986). The advantage of the comparative design, over the two alternatives noted above, is that groups differ only in terms of specific treatment factors to which any differential outcomes may then be attributed (Kazdin, 1986).

This design avoided confounding treatment parameters in that the two conditions were different on only one factor, the self-efficacy intervention element received by patients in the experimental condition (Kazdin, 1986; Strayhorn, 1987), and was felt to be more ethically feasible than a no-treatment control condition.

5.7 Data Analysis[1]

Descriptive analyses were conducted using BMDP and SPSSX. Two primary techniques were used for the main analyses. Hypotheses 1, 2, and 3 (regarding the effects of treatment condition on self-efficacy, outcome expectancy, adherence and anxiety) were tested using hierarchical repeated-measures ANOVA designs with groups nested within treatment conditions (Kirk, 1982). These analyses were carried out using the SPSSX MANOVA procedure (SPSS Inc., 1986), MANOVA being chosen to guard against type 1 error (Shaffer, 1979).

Subjects were treated in groups of 6-8 to approximate the "real world" delivery of stress management intervention in health care settings, economize therapist time, and facilitate data collection. The group mode of treatment, however, creates a nuisance variable (i.e., "group", made up of the 20 groups nested within the two treatment conditions). Three different strategies might be considered to deal with this nuisance variable. 1) The group factor could be disregarded on a priori grounds (i.e., non-specific factors such as time, group composition, or the social environment of the group should not be influential), the data could be pooled, and individuals could be used as the sole level of analysis. This has the advantage of simplicity, but assumes without warrant that the nuisance variable has no

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1 Procedures used to check the data set for normality and outliers, and the protocols for dealing with outliers and missing data, are described in Appendix G.

impact. This risks employing an incorrect error term in MANOVA, resulting in a liberally biased F-test (Kirk, 1982). 2) Focusing on groups as the unit of analysis, allowing for the assessment of the influence of non-specific group factors, would take into account the impact of treatment on groups, but it would be impossible to assess the impact of the intervention on the individual unit of analysis, which, however, is of primary interest. 3) A hierarchical strategy (Kirk, 1982; Keppel, 1973) was judged to be the correct course between the preceding two extreme positions, and was the approach adopted in this study. If this nested, hierarchical design had not been employed, the data would (erroneously) have been treated as if they had been derived from a one-way, completely randomized design (Kirk, 1982). On theoretical grounds, group was not expected to be an influential factor. The hierarchical strategy allows an empirical determination of its actual influence, and uses a between-subjects error term in MANOVA that takes into account group variability as nested within the two treatment conditions.

Hypotheses 4-A and 4-B were evaluated using path analysis, calculated by means of SPSSX REGRESSION (SPSS Inc., 1986). A recursive model was assumed, and path calculations were made by means of the computational rules provided by Burt (1973). Path analysis enables several independent, intervening, and dependent variables to be examined simultaneously in the context of theory-based hypotheses. Direct and indirect causal effects as well as non-causal effects are made explicit in path models (Asher, 1976). Because of the problems associated with autocorrelated disturbances, which are virtually inevitable in longitudinal data sets (Heise, 1970), lagged variables were not introduced to the path models tested here. With lagged variables, "ordinary least squares regression will no longer yield unbiased estimates of the regression coefficients, and this is true regardless of sample size" (Markus, 1979, p. 50).

Four path models were tested, one each for self-efficacy and outcome expectancy, at the post-treatment and follow-up time-points. The post-treatment time point was chosen to test the effects of the maximum dose of treatment on the variables. The follow-up time point was used to assess possible changes in causal relationships among variables over time and while patients were not in active treatment. Also it is important to measure self-efficacy after a subject has had experience with the task to avoid measurement bias due to inflated self-efficacy scores (Hoelsher, 1984). Self-efficacy and outcome expectancy were not tested together because their causal relationship was not specified.

6. RESULTS

6.1 Pre-treatment Comparisons

The experimental and control conditions did not differ on the pre-treatment variables, taken either as a group (Hotellings $T^2 = 4.07$, $\underline{F}_{(10,110)} = .37$, $\underline{p} > .95$), or individually, as is shown in Table 1.

Insert Table 1 about here

In addition, the conditions did not differ on the pre-intervention measures of self-efficacy, outcome expectancy and adherence, Hotellings $T^2 = .082$, $\underline{F}_{(3,16)} = .439$, $\underline{p} > .73$. Appendices H-J present means and standard deviation for these variables across intervention sessions.

There were no significant differences between conditions on the demographic variables of marital status, $X^2_{(2)} = .89$, $\underline{p} > .20$ (Yates corrected); educational level, $X^2_{(3)} = 1.28$, $\underline{p} > .20$; work status, $X^2_{(3)} = .37$, $\underline{p} > .20$ (Yates corrected); and diagnosis, $X^2_{(5)} = 4.62$, $\underline{p} > .20$. Table 2 displays the descriptive data for these variables.

Insert Table 2 about here

Across the two conditions, attrition appears to have been essentially random, given that of the 160 subjects who had been randomly assigned to conditions equal proportions became research subjects (n = 121) or attriters (n = 39), $X^2_{(1)} = 0.55$, $p > .20$. Group equivalence on pre-treatment and pre-intervention measures was maintained after attrition. Attrition data is provided in Table 3.

Insert Table 3 about here

There was no differential rate of treatment attendance between experimental and control conditions. A series of 2 x 2 Chi square analyses, employing the Yate's correction, revealed no significant differences for any of the eight sessions: session 1, $X^2_{(1)} = .0008$, $p > .97$; session 2, $X^2_{(1)} = .80$, $p > .37$; session 3, $X^2_{(1)} = .36$, $p > .54$; session 4, $X^2_{(1)} = .068$, $p > .79$; session 5, $X^2_{(1)} = .78$, $p > .37$; session 6, $X^2_{(1)} = .002$, $p > .96$; session 7, $X^2_{(1)} = .59$, $p > .44$; session 8, $X^2_{(1)} = .037$, $p > .84$. The actual proportions of attenders and non-attenders by session are presented in Table 4.

Insert Table 4 about here

6.2 Treatment Effects

6.2.1 Hypothesis 1-A: Effects of Treatment[2] on Self-Efficacy

The statistical model used to assess the effects of intervention condition on self-efficacy during treatment was a hierarchical MANOVA. The between-subjects variable had two levels, corresponding to the experimental and control conditions, and the within subjects variable comprised the five timepoints of self-efficacy measurement. Figure 2 presents the mean self-efficacy scores over time.

Insert Figure 2 about here

The MANOVA revealed a significant univariate main effect for condition, $F_{(1,18)} = 4.57$, $p < .046$. From the initiation of the self-efficacy enhancing intervention through to the end of treatment, subjects in the experimental condition had significantly higher levels of self-efficacy than did their control counterparts.

The within-subjects main effect for time was assessed using the MANOVA (Shaffer, 1979). There was no significant effect for group within

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2 Treatment refers to the two levels of treatment, i.e. the experimental condition, which received the self-efficacy- enhancing intervention in addition to basic stress management, and the control condition, which received only basic stress management.

condition by time, Hotellings $T^2 = .87$, $F_{(18, 101)} = 1.16$, $p > .19$. Therefore, variance related to groups nested within conditions was not a significant factor (i.e., group was not a significant nuisance variable). The main effect for time was highly significant, Hotellings $T^2 = .19$, $F_{(4, 98)} = 4.72$, $p < .002$, indicating that self-efficacy scores for both conditions together did not remain constant over time. However, because of a significant condition by time interaction (discussed below), pairwise comparisons of self-efficacy means over time were carried out within each condition separately. As described in Tables 5-A and 5-B, there were no significant pairwise mean differences for the experimental condition. However, for the control condition, each comparison between time 1 self-efficacy and subsequent means was of significant magnitude. This indicates that while self-efficacy scores in the experimental condition remained stable over time, those for the controls did not. The significant effect for time was due, in fact, to a decrease in self-efficacy in the control condition.

Insert Tables 5-A and 5-B about here

As was already mentioned, the condition by time interaction was significant, $F_{(4,72)} = 3.50$, $p < .01$. That is, the trend for self-efficacy over time was not parallel for the two conditions. To further analyse this interaction, multiple comparisons were conducted using Fisher's protected t-test procedure (Carmer & Swanson, 1973). The results of this analysis are displayed in Table 6.

Insert Table 6 about here

At pre-intervention, there was no significant difference between groups on self-efficacy. However, the differences between means for all subsequent comparisons were highly significant. Apparently, the interaction term was significant due to group equivalence at Time 1; once the experimental intervention was initiated, the difference between conditions on self-efficacy was significant and stable for the remainder of treatment, as observed by the relative constancy of self-efficacy scores for the experimental patients compared to the sudden initial decline among the controls.

6.2.2 Hypothesis 1-B: Effects of Treatment on Outcome Expectancy

A hierarchical MANOVA was employed to determine the effects of intervention condition on outcome expectancy during treatment. The between-subjects variable had two levels, corresponding to the experimental and control conditions. The within-subjects variable comprised the five timepoints of outcome expectancy measurement. Figure 3 presents the mean outcome expectancy scores over time.

Insert Figure 3 about here

The univariate main effect for condition was not significant, $F_{(1,18)}$ = 2.16, $p > .16$. The group within condition by time effect was not significant, $T^2 = .91$, $F_{(18, 101)} = 1.22$, $p > .19$. Variance related to groups within conditions was not a significant factor, thus group was not a significant nuisance variable. There was no significant multivariate effect for time, $T^2 = .089$, $F = 1.48$, $p > .21$, and the interaction effect of condition by time was also non-significant, $T^2 = .12$, $F = .44$, $p > .78$. The experimental intervention, which was aimed at enhancing self-efficacy only, had neither a main or interaction effect on outcome expectancy. In neither condition did the outcome expectancy scores change over time.

6.2.3 Hypothesis 2: Effects of Treatment on Adherence

The statistical model used to analyze the effects of intervention condition on adherence during treatment was a hierarchical MANOVA. The between-subjects variable had two levels, corresponding to the experimental and control conditions; the within-subjects variable represented the eight weeks of adherence measurement. Figure 4 illustrates mean adherence scores over time.

Insert Figure 4 about here

There was a highly significant univariate main effect for condition, $F_{(1,18)} = 15.53$, $p < .001$. Subjects in the experimental condition practiced at significantly higher levels than did controls. The within-subjects effects were assessed using the multivariate F tests. The group within condition by time interaction was not significant, Hotellings $T^2 = 1.27$, $F_{(18,101)} = 1.11$, $p > .239$. The variance related to groups within conditions was not a significant factor; thus group was not a significant nuisance factor. There was a highly significant main effect for time, Hotellings $T^2 = 1.07$, $F_{(7, 95)} = 14.59$, $p < .0001$. Adherence declined in both conditions over the duration of the study. The absence of a significant condition by time interaction, Hotellings $T^2 = 1.40$, $F_{(7, 12)} = 2.40$, $p < .09$, revealed that the trend of adherence scores over time was virtually parallel for the two conditions.

To further explore the time main effect, adherence scores at each time point were collapsed across conditions and pairwise comparisons on total sample means for the time points were conducted to determine which pairs of means were significantly different. Table 7 presents the pairwise multiple comparisons, employing two-tailed t-tests with alpha = .05 but adjusted by the Bonferroni correction, a strategy recommended by Maxwell (1980) and Shaffer (1979) for this type of research design.

Insert Table 7 about here

Although the experimental condition had significantly higher practice rates throughout the intervention and follow-up periods, the intervention did not alter the rate of decay over time - both conditions decayed at a similar rate. It appears that the impact of the experimental intervention was to boost adherence to a sufficiently high level early in treatment to maintain subsequent practice at a higher level than that of the controls in spite of the parallel decay slopes.

6.2.4 Hypothesis 3: Effects of Treatment on Anxiety

The statistical model used to analyse the effects of condition on state anxiety was a hierarchical MANOVA. The between-subjects variable had two levels, corresponding to the experimental and control conditions, and the within-subjects variable represented the pre-treatment, post-treatment and follow-up periods. Figure 5 illustrates the mean anxiety scores over time.

Insert Figure 5 about here

There was no significant univariate main effect for condition, $F_{(1,18)}$ = 1.65, $p > .216$. That is, there was no differential treatment effect on anxiety. The effect for group within condition by time was not significant, $T^2 = .33$, $F_{(18, 101)} = .90$, $p > .62$. The variance related to groups within conditions was not significant, i.e., group was not a significant nuisance factor. There was, however, a highly significant main effect for time, T^2 = .12, $F_{(2, 100)} = 6.00$, $p < .003$. The condition by time interaction was non-significant, $T^2 = .08$, $F = .74$, $p > .48$, indicating that the trend for anxiety scores over time was relatively parallel for the experimental and control conditions.

To further explore the time main effect, anxiety scores were collapsed across the experimental and control conditions and pairwise comparisons on total sample means at each time point were conducted to determine points of significant difference. Table 8 shows the pairwise multiple comparisons, which employed two-tailed t-tests with alpha = .05 adjusted using the Bonferroni correction. Only the comparison between pre-treatment and follow-up reached significance, indicating that the pre-treatment to follow-up drop in anxiety was significant for the total sample.

Insert Table 8 about here

6.2.5 Hypotheses 4A and 4B: Mediational Effects Among Self-Efficacy, Outcome Expectancy, Adherence, and Anxiety

Self-Efficacy as a Mediator of Intervention Effects at Post-Treatment

Figure 6 presents the path model and coefficients for the hypothesized relationships among the treatment variable, self-efficacy, adherence, and anxiety at post-treatment.

Insert Figure 6 about here

The experimental intervention had moderate and significant direct effects on post-treatment self-efficacy (p_{21} = .33)[3] and adherence (p_{31} = .29), and, as expected, a weak non-significant effect on anxiety (p_{41} = -.10). Self-efficacy had a smaller yet significant direct effect on adherence

3 The notational convention in path analysis is to indicate a causal path by a lower case p. The first digit following the p indicates the "effect" variable from a preceding variable, which itself is indicated by the second digit. For example, p_{21} is read as the causal path from variable 1 to variable 2.

(p_{32} = .22) and a negligible effect on anxiety (p_{42} = -.08). The direct effect of adherence on anxiety was very weak and non-significant (p_{43} = -.03). The experimental intervention had a direct effect on adherence (i.e., p_{31} = .29) that was four times as strong as its indirect effect on adherence through self-efficacy (i.e., $p_{21} \times p_{32} = .33 \times .22 = .07$). This suggests that at post-treatment, self-efficacy was only a weak mediator of treatment effects. Table 9 presents the three types of effects implied by the path diagram: causal direct effects, causal indirect effects, and non-causal effects comprised of shared indirect and spurious covariation.

Insert Table 9 about here

The zero-order correlation (i.e., the total association between any two variables), is the sum of the direct, indirect, and/or non-causal effects operative in that particular case. Table 10 presents the zero-order correlations.

Insert Table 10 about here

Self-Efficacy as a Mediator of Intervention Effects at Follow-up

Figure 7 presents the path model and coefficients for the hypothesized relations among treatment, self-efficacy, adherence, and anxiety at follow-up.

Insert Figure 7 about here

As at post-treatment (cf. Figure 6), at follow-up the experimental intervention had moderate and significant direct effects on self-efficacy (p_{21} = .34) and on adherence (p_{31} = .27). The direct effect of self-efficacy on adherence was significant (p_{32} = .20), although it was slightly smaller than at post-treatment. The direct effect of self-efficacy on anxiety was again negligible (p_{42} = -.05). Although the direct effect of adherence on anxiety was of larger magnitude than at post-treatment (p_{43} = .15), it was still relatively weak and non-significant. Table 11 presents the causal direct, causal indirect and non-causal effects implied by the path diagram.

Insert Table 11 about here

At follow-up the experimental intervention once again had a largely direct effect on adherence, one that was approximately four times as strong as its indirect effect on adherence through self-efficacy. This again suggested that self-efficacy was only a weak mediator of treatment effects. Table 12 presents the zero-order correlations.

Insert Table 12 about here

<u>Outcome expectancy as a mediator of intervention effects at post-treatment</u>

Figure 8 presents the path model and coefficients for the hypothesized relations among treatment, outcome expectancy, adherence, and anxiety at post-treatment.

Insert Figure 8 about here

In contrast with its effects on self-efficacy at post-treatment and follow-up, the experimental intervention had only a weak, non-significant direct effect on outcome expectancy (p_{21} = .13). The direct effect of the intervention on adherence remained significant (p_{31} = .34). The direct effect of outcome expectancy on adherence was weak and non-significant (p_{32} = .12). The direct effect of outcome expectancy on anxiety, on the other hand, was significant (p_{42} = -.23). The indirect path for outcome expectancy to anxiety through adherence was very weak and non-significant ($p_{32}p_{43}$ = .001). As in Figures 6 and 7, adherence had a negligible direct effect on anxiety (p_{43} = -.01), while the direct effect of treatment on anxiety was non-significant (p_{41} = -.11). Table 13 presents the causal direct, causal indirect and non-causal effects implied by the model.

Insert Table 13 about here

The indirect path from treatment through outcome expectancy to adherence was very weak ($p_{21}p_{32}$ = .02), suggesting that outcome expectancy does not mediate the adherence-promoting effects of treatment. Table 14 presents the zero-order correlations.

Insert Table 14 about here

Outcome Expectancy as a Mediator of Intervention Effects at Follow-up

Figure 9 presents the path model and coefficients for the hypothesized relations among treatment, outcome expectancy, adherence, and anxiety at follow-up.

Insert Figure 9 about here

As at post-treatment, the experimental intervention had a weak, non-significant direct effect on outcome expectancy (p_{21} = .14), and a significant direct effect on adherence (p_{31} = .32). The direct effect of outcome expectancy on adherence was non-significant (p_{32} = .15). The direct effect of outcome expectancy on anxiety was significant (p_{42} = -.21), as was also the case at post-treatment. As in Figures 6, 7 and 8, adherence had a non-significant direct effect on anxiety (p_{43} = -.13) and the direct effects of treatment on anxiety were, as expected, negligible (p_{41} = .01). Table 15 presents the causal direct, causal indirect, and non-causal effects implied by the model.

Insert Table 15 about here

The indirect effect of treatment on adherence through outcome expectancy was negligible ($p_{21}p_{32}$ = .02). The indirect effect of outcome expectancy on anxiety through adherence was again negligible ($p_{32}p_{43}$ = -.02). Table 16 presents the zero-order correlations among the variables in the model.

Insert Table 16 about here

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7. DISCUSSION

7.1 Hypothesis 1-A: Effects on Self-Efficacy

As hypothesized, the self-efficacy intervention resulted in significantly higher levels of self-efficacy for patients in the experimental condition versus the control, and these differences were stable over time. However, the intervention did not raise self-efficacy over time, but rather served to maintain it close to the pre-intervention level. In contrast, without the benefits of the intervention, the control subjects experienced an immediate decline in self-efficacy. This finding suggests that without previous experience on the task, initial estimates of self-efficacy were inflated such that, without an efficacy-enhancing intervention, self-efficacy declined significantly. Unpublished data from Hoelscher (1984) also revealed that initial self-efficacy estimates for relaxation practice are likely to be inflated. The present data support Bandura's (1986b) contention that without previous experience on a task, estimates of self-efficacy may be overly optimistic. In such instances, self-efficacy may decline if the task is more difficult than originally believed.

7.2 Hypothesis 1-B: Effects on Outcome Expectancy

The absence of significant between- and within-subjects effects for treatment condition on outcome expectancy indicates that the two conditions were equivalent on this measure over the course of treatment. This implies that the self-efficacy intervention did not impact significantly on outcome expectancy, which was the theoretically competing variable in this study. At least in comparison with outcome expectancy, the intervention had a selective impact on its planned target, self-efficacy. This finding supports the internal validity of the experimental intervention and suggests that the treatment-element control strategy was successful in equalizing patient expectancies. These data are also consistent with previous theoretical contentions that self-efficacy and outcome expectancy can be measured and influenced independently (Maddux et al., 1986, 1982; Lee, 1984a; Manning & Wright, 1983).

7.3 Hypothesis 2: Effects on Adherence

In addition to maintaining higher levels of self-efficacy, the experimental intervention did promote significantly higher levels of adherence over time for patients in the experimental condition. However, it did not have a differential effect on practice decay rates over time. The effect of the intervention was limited to boosting adherence sufficiently, in the early phase of treatment, to maintain practice levels significantly higher than the controls. Taylor et al. (1983) reported a similar decay in their study of relaxation adherence.

Throughout the study adherence to the practice prescription, even in the experimental condition, was very low. This may be related to three factors. First, the group mode of treatment made it necessary to employ a standardized treatment rationale for the relaxation intervention. This is not optimal stress inoculation training, which should be based on a shared conceptualization of treatment and individual rationale-provision (Cameron, 1978); adherence may have suffered as a result.

Second, although Hoelscher (1984) and Hoelscher et al. (1986) also found significant decay, their reported adherence rates were approximately double those obtained in this study. Two important differences in research methods between the studies may help to explain this disparity. The Hoelscher studies used cumulative minutes of tape play over two week periods as the dependent measure, whereas this study used the number of completed tape plays during one week periods, a more conservative and sensitive measure (cf. "5.4.3", and Appendix C). Moreover, the low levels of anxiety in this sample of patients, as compared to subjects in the Hoelscher studies, could have resulted in lower motivation for practice. This latter issue is discussed further in section 7.4 below.

Third, the treatment prescription in this study may have been too burdensome and beyond what could be reasonably expected of the patients (Meichenbaum & Turk, 1987). The twice-daily prescription over the entire study was somewhat artificial in terms of clinical practice, where patients would be taught abbreviated methods of relaxation as treatment progressed and weaned off the relaxation practice tape (Revel, Baer, & Cleveland, 1988). In the absence of dose-response data for relaxation practice with a tape, the twice daily practice criterion was set in accordance with the clinical literature which suggests this frequency to be optimal (Bernstein & Borkovec, 1973; Borkovec & Sides, 1979; Bernstein & Given, 1984). While this criterion served the research goals of the study, its clinical relevance is unclear. As dose-response data becomes available, adherence criteria for relaxation should be based on the minimal level of tape-assisted practice required to obtain desired treatment effects. If patients were regularly practicing without the tape as the study progressed, then the decay in tape-assisted practice actually represents a sought after clinical outcome. These hypotheses remain to be tested in future studies of differential relaxation-practice prescription.

Prescribed relaxation practice was the sole adherence outcome in this study because it provided an opportunity to employ a direct, objective and unobtrusive measure of adherence, the Relaxation Practice Monitor. Consequently, these results do not generalize to all components of stress inoculation training. Future studies might employ self-report or behavioral observation measures (taking into account their methodological limitations) to assess adherence to other intervention components and provide a broader understanding of adherence to a range of stress management interventions.

7.4 Hypothesis 3: Effects on Anxiety

Patients in both conditions experienced a significant reduction in state anxiety from pre-treatment to follow-up, with no significant main effect for treatment condition. By itself, this is not an unexpected finding, given that both received active treatments. However, the absence of a no-treatment control group precludes the interpretation of treatment-caused reductions. That there was a reduction at all is perhaps surprising, given the low pre-treatment level of anxiety in the sample. This in turn raises the possibility that social desirability alone might account for the lower anxiety scores at follow-up.

The limitations of this study have important implications for interpretation of these data on anxiety. The methods used to assess the effectiveness of the relaxation intervention on anxiety reduction were probably not optimal, due to the sample selection and outcome measurement protocols used. First, the pre-treatment state anxiety level of the sample was not clinically significant. This was an unexpected finding, given the clinical literature indicating anxiety to be a relatively common problem for cardiac patients (Knapp & Blackwell, 1985; Hackett & Cassem, 1984; Wrzeniewski, 1977). However, at least one other study on a similar target population reported equally low levels of anxiety (Langosch et al., 1982). In retrospect, the study inclusion criteria may have served to exclude patients with higher levels of state anxiety, thus leaving a pre-selected, low-anxious sample.

Second, state anxiety was probably too narrow an outcome measure of the effects of treatment in this sample. Conceptualizing a mood-based outcome more broadly (i.e., as encompassing more than state anxiety), would have been useful. Some support for this is evident in the BSI GSI pre-treatment data. The sample's general level of psychological distress was one standard deviation unit above the mean for cardiac rehabilitation patients (Rose & Hotz, 1987). Lamping (1986) has discussed the problem of outcome measures for health psychology interventions, noting that measures derived from traditional mental health models may well not be sensitive or specific enough for health psychology applications.

Because anxiety involves physiological, behavioral, and emotional factors, choosing a single outcome (such as state anxiety) enables only a limited opportunity to assess treatment outcome. Employing additional measures of daily stressor intensity, observer ratings of behavioral performance, and physiological reactivity would allow a broader assessment of treatment-relevant outcomes (Lamping, 1986).

7.5 Hypotheses 4-A and 4-B: Mediational Effects Among Self-Efficacy, Outcome Expectancy, Adherence and Anxiety

In attempting to shed light on how self-efficacy versus outcome expectancy may mediate adherence and, secondarily, on the mediational role of adherence in anxiety reduction, these data provide little or no support for any of the hypothesized mediational roles, despite several significant (but only modest) causal direct relationships among the variables.

7.5.1 Hypothesis 4-A

Hypothesis 4-A was not supported by the data. Even though the experimental intervention appeared to result in higher levels of self-efficacy and adherence, self-efficacy did not mediate much of the effect of the intervention on adherence. The direct effect of treatment on adherence was much stronger than its indirect effect through self-efficacy. This finding may be partly accounted for by the fact that although the self-efficacy intervention had a significant effect on self-efficacy, this effect was not very large. For self-efficacy to have a major mediational role, the paths between treatment and self-efficacy, and between self-efficacy and adherence, would have had to be of substantially greater magnitude.

Despite the previously reported relatively strong correlations between self-efficacy and such health behaviours as smoking cessation, weight loss, pain control, exercise capacity, abstinence from alcohol (O'Leary, 1985; Condiotte & Lichtenstein, 1981; DiClemente, 1986; Ewart et al., 1986; Godding et al., 1985), counter-phobic behaviour and approaches to anxiety-provoking situations (Bandura et al., 1987; Bandura, 1983; Bandura et al., 1980; Barrios, 1983; Lee, 1984a), in this study self-efficacy was only modestly correlated with adherence to relaxation practice, and had only a weak mediating effect. One implication of this is that self-efficacy may be a more important determinant of behaviour for complex and difficult tasks on which people anticipate difficulty than for the comparatively simple and straightforward regimen of relaxation practice. Further adherence research on regimens of differing difficulty would help clarify the range of self-efficacy's influence as a mediator of adherence.

Even with relatively high levels of self-efficacy in the experimental condition, adherence remained low and decayed considerably over time. This is consistent with the Belisle et al. (1987) finding that self-efficacy contributed a significant but only small amount of the explained variance in exercise adherence.

The relatively modest impact of the experimental intervention on self-efficacy may have been due to efficacy-enhancing components inherent to the generic stress management treatments. Specifically, the comparative design used in this study might have concealed the strength of the relationship between self-efficacy and adherence, given that both conditions received active interventions. The self-efficacy treatment-element would perhaps have had to have been very potent (in addition to the efficacy-enhancing properties inherent in the stress management intervention) for self-efficacy to have emerged as a significant mediator of treatment effects.

The determination of adherence mediation was probably limited by the nature of the model tested in this study. Although self-efficacy had a direct effect on adherence at post-treatment and follow-up, the paths were far from unity, indicating that the model was incomplete. It might be fruitful in future studies to include a theoretically more proximal determinant of behaviour such as behavioural intention (Ajzen & Madden, 1986), and control for patients' beliefs about the relevance of treatment to their current needs and beliefs about the importance of practice.

The strength of the direct effect of the self-efficacy intervention on adherence suggests that, in addition to enhancing self-efficacy, it was influencing adherence in other ways. The experimental intervention could have had direct adherence- enhancing properties, or it could have affected a mediating variable or set of variables not assessed in the model. It may be that the self-efficacy intervention was simply better behaviour therapy than the intervention received by the controls, given its problem-solving focus, emphasis on developing proximal practice goals, and orientation toward practice.

Alternatively, the design weakness associated with a single-blind study may account for this finding. In this study, only the patients were blind to the objectives of the study and the treatment condition to which they were assigned. The therapists did not know the research hypotheses, yet they were aware that enhancing adherence was an objective, and they knew which intervention they were delivering at a given time. Thus, it is conceivable the therapists unwittingly introduced systematic bias to the experimental intervention that directly affected adherence but did not affect self-efficacy. Because the methodology did not include formal implementation checks on the delivery of treatment, the nature of and the extent to which such systematic bias might have undermined the internal validity of the intervention cannot be addressed. During routine supervision the therapists were reminded to follow the manuals (cf. "5.2.3"). Yet, random implementation checks by blind raters would have allowed more substantive conclusions about therapists' adherence to the treatment manuals.

However, one possible source of systematic bias lies in the unwitting strengthening of behavioural intention toward relaxation practice. Patients in the experimental condition may have been led to place greater importance on practice than was the case for the control subjects, and consequently may have had stronger behavioural intentions. This explanation is consistent with Maddux et al. (1982), Maddux et al. (1986), and Maddux & Stanley (1986), who believe that self-efficacy is but one variable within expectancy-value theory. The latter also includes outcome expectancy and behavioural intentions. One recent large-scale study found that across health promotion regimens, self-efficacy was an important determinant of behaviour change, but its effects were secondary to those of behavioural intentions (Mullen, Hersey, & Iverson, 1987). Further support for this view is provided by Ajzen and Madden (1986) who reported that an expanded theory of reasoned action, which included "perceived behavioral control", was a strong predictor of both behavioural intention and behaviour. They concluded that the perception of behavioural control, which they liken to self-efficacy, has a significant impact on intentions to try when goal attainment is at least partly controlled by factors outside a person's control.

The effect of self-efficacy on adherence, although statistically significant at both post-treatment and follow-up, was relatively weak. Higher percepts of self-efficacy were associated with higher levels of adherence, whereas higher levels of outcome expectancy were not. Thus, from this study, there is only limited support for the role of self-efficacy as a determinant of adherence to relaxation practice. These data clearly suggest limits to the generality of self-efficacy as a central mediator of behaviour change due to treatment.

7.5.2 Hypothesis 4-B

Contrary to the hypothesis, the path analyses revealed that adherence to the relaxation protocol bore no significant relationship to changes in anxiety level. Adherence did not mediate the effects of treatment and/or self-efficacy on anxiety, nor did adherence have a significant direct effect on anxiety. This is consistent with previous studies which found no significant correlations between relaxation practice level and blood pressure reductions (Taylor et al., 1983; Hoelscher, 1987) and trait anxiety (Hoelscher, 1984). However, these are the first data that have been brought to bear on the issue from a causal modelling perspective in an experimental study which attempted to enhance adherence.

The finding that higher levels of outcome expectancy are antecedent to reductions in anxiety in a way that does not involve mediation through adherence extends similar findings reported by Lehrer and Woolfolk (1984) and Beiman (1976). Rather than outcome expectancy being an intangible "non-specific effect", it was the most important determinant of anxiety reduction in this study.

Given the low pre-treatment anxiety level of the sample, it is not surprising that adherence to relaxation practice was not a significant mediator of anxiety reduction; there was little potential for anxiety to decrease. Future studies of adherence to stress management interventions, which include tests of treatment effectiveness on psychological variables, should either seek patients who are in greater psychological distress or more clearly define clinical objectives.

In addition, the absence of a strong causal relationship between adherence to relaxation practice and anxiety reduction may be due, in part, to the confounding of the relaxation intervention with the other cognitive interventions administered to both conditions in the generic stress management intervention. Clearer relationships may emerge from studying unitary protocols in samples not involved in multifactorial rehabilitation programmes.

The absence of a causal relationship between adherence level and anxiety reduction may also be partly due to the generally low level of anxiety in the sample and consequent small pre-treatment to follow-up reduction in scores. When combined with generally low adherence scores, this created a data set with little variability. In addition, the aforementioned problems with the choice of state anxiety as a treatment measure may have resulted in missing changes in treatment relevant variables that were not measured.

7.6 Implications

7.6.1 Research Implications

Adherence to progressive muscle relaxation practice is an example of a voluntary preventive or health promotion intervention. It may be quite different from other protocols where the intervention requires taking an external stimulus (i.e. a pill to reduce an acute symptom), or changing a habitual behaviour (i.e. dietary habits, smoking, alcohol consumption, avoidance of feared stimuli or anxiety-producing situations, or performance of difficult tasks). Relaxation may have less salience for patients in comprehensive rehabilitation programmes in the context of additional regimens aimed at reducing risk for further CHD. It may well be that a comprehensive cardiac rehabilitation programme is not the best source of patients for such studies. Eighteen months were required to collect the present data, and it would have taken at least twice as long to obtain a sufficient sample of more distressed patients, making the study unfeasible in view of time constraints.

Studies of patients in comprehensive treatment programmes should assess and control for degree of importance of and motivation toward each component of the total regimen to the individual patient. Bandura (1982a, 1982b, 1986b) does state that behavioural performance requires sufficient levels of motivation in addition to self-efficacy.

Where relaxation treatment effectiveness is an outcome of interest, inclusion criteria should ensure that the target population is sufficiently distressed to make reduction of symptoms a feasible objective. In addition, the psychological adjustment factors relevant to the coping issues faced by the sample must be appropriately measured. Studies of stress management interventions in cardiac rehabilitation should specify whether the treatment target is general anxiety, cardiac anxiety associated with threats to life, or difficulty coping with attempts at risk-factor modification. The treatment provided should be unimodal to avoid confounding potentially active elements with outcomes. Specifically, the impact of adherence to relaxation on anxiety is impossible to assess when patients receive multimodal intervention, as treatment factors other than adherence to relaxation can affect the variability of anxiety scores.

Attribute by treatment interaction designs would be helpful to answer such questions as "for what patients, with what levels of self-efficacy or outcome expectancy are particular types of intervention required for maximum treatment effectiveness?" Interventions targeting self-efficacy or outcome expectancy may be differentially important for different clusters of patients.

7.6.2 Clinical Implications

Self-efficacy was a stronger determinant of adherence and higher levels of outcome expectancy were associated with anxiety reduction. Yet, the relatively low power of the self-efficacy intervention, the narrow measure of anxiety, and the multiple components of the stress management intervention allow only guarded generalizations. The data suggest that self-efficacy and outcome expectancy may have differential significance for overall treatment effectiveness and this has interesting implications for clinical practice. As Lee (1984a) surmised, both self-efficacy and outcome expectancy must be taken into account for optimal treatment success. By directly assessing patients levels of self-efficacy and outcome expectancy in relation to general and specific components of their treatment, factors which may mitigate against treatment effectiveness could be dealt with proactively.

Care should be taken to assess the treatment needs of the target population. For example, are patients predominantly anxious, depressed, hostile or suffering undifferentiated symptoms due to problems coping with current life stressors? Generic stress management, while capable of attracting a sufficient sample to study, may not be relevant to the treatment needs of all patients who seek it. The patients in this study may have been experiencing difficulty coping with stress, as suggested by the GSI, but were not state anxious. It may be that generic stress management should take a back seat to intervention aimed at specific heart disease-relevant stressors identified by such procedures as sequential criterion assessment (Turk, 1980). Anxiety is not the only result of difficulty coping with stressors (Lazarus & Folkman, 1984).

The absence of a causal relationship between adherence and anxiety has implications for clinical guidelines for relaxation training, at least with cardiac rehabilitation patients in group stress-management intervention programmes. Apparently, such patients cannot be expected to practice a relaxation exercise twice daily, even at the outset of treatment. Consequently, careful consideration should be given to practice levels suggested to patients to avoid setting up unrealistic adherence goals and consequent self-attributions of failure on the part of patients.

Overall, the generalizability of the path model results is somewhat limited as the analysis employed standardized regression coefficients to determine path coefficients. The advantage of this is that the path coefficients are scale free and can be compared among different variables. The disadvantage is that they are population specific, making it inadvisable to generalize across populations. Furthermore, the fact that the patients in this study were male, and in a comprehensive rehabilitation programme may make the sample less comparable to others. Future studies focusing on female patients would be a valuable addition to the literature.

In this experiment, an intervention aimed at enhancing patients' self-efficacy toward progressive muscle relaxation practice resulted in higher levels of self-efficacy and adherence for patients in the experimental condition. Yet, despite optimism inspired by these ANOVA results, the path analyses provided little support for the mediational hypotheses. Level of adherence was most strongly influenced by an effect of treatment that had little to do with mediation by self-efficacy or outcome expectancy at both post-treatment and follow-up. At four weeks post-treatment, the direct effects of the intervention remained the strongest determinant of adherence, with the effect of self-efficacy becoming weaker.

The results of this study did not support Bandura's (1982a, 1982b, 1986b) contention that self-efficacy is the central mediator of behaviour change. In spite of the apparently concomitant effects of the experimental intervention on self-efficacy and adherence as revealed by the ANOVA's, the indirect causal effect of the intervention on adherence through self-efficacy was weak. Self-efficacy is a partial determinant of adherence; however, other mediating variables need to be identified to attain a more complete understanding of adherence to relaxation practice. Findings regarding the mediational role of adherence were less clear due to weaknesses in the treatment outcome methodology; yet, in this study, adherence had neither a mediating nor a significant direct relationship to anxiety level at post-treatment or follow-up.

8. REFERENCES

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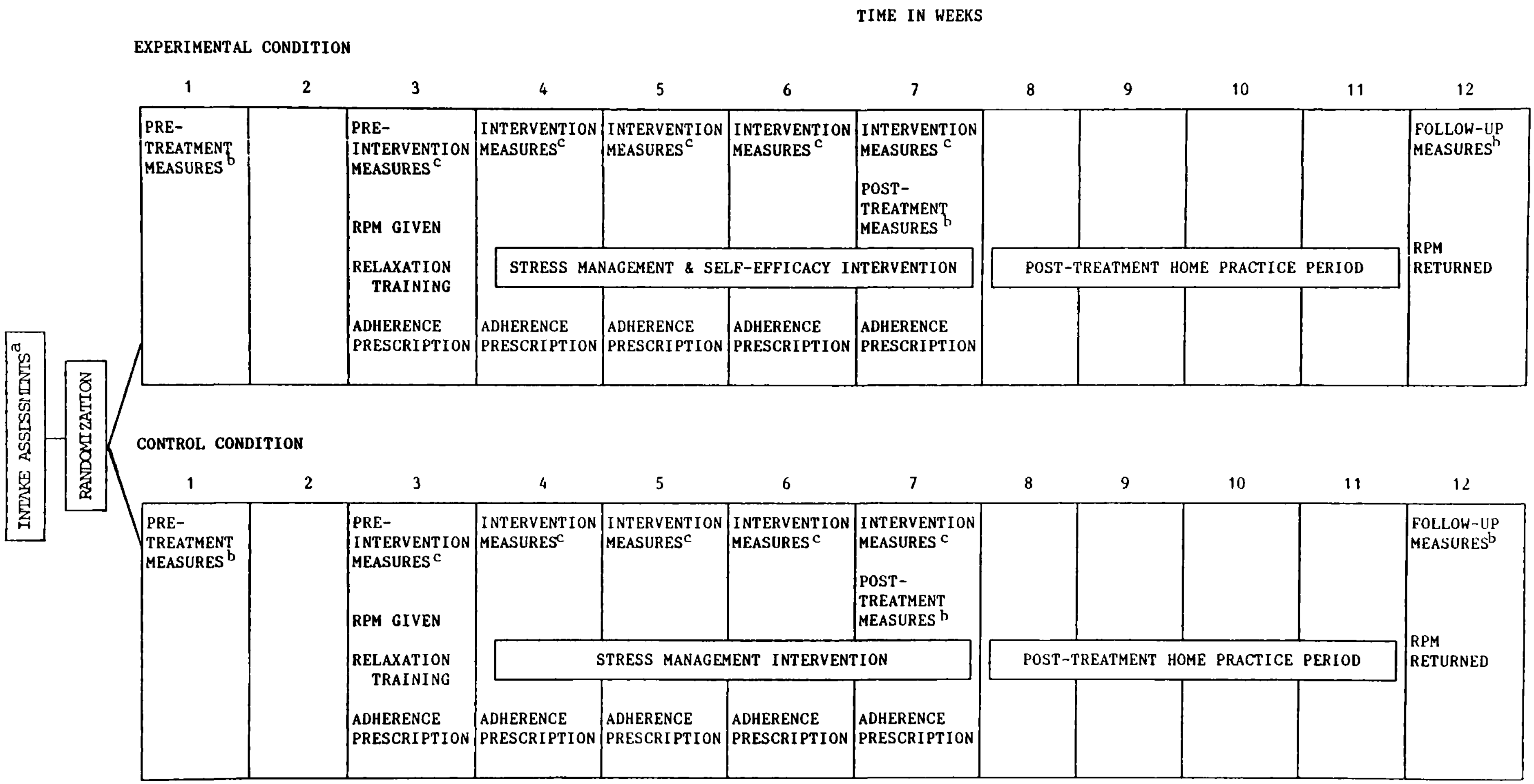


a BRIEF SYMPTOM INVENTORY
b STATE-TRAIT ANXIETY INVENTORY, KRANTZ HEALTH OPINION SURVEY, & MULTI FACTORIAL HEALTH LOCUS OF CONTROL
c SELF-EFFICACY INVENTORY AND OUTCOME EXPECTANCY INVENTORY

Figure 1. Data Collection and Intervention Protocols

Figure 2. Mean Self-Efficacy Scores

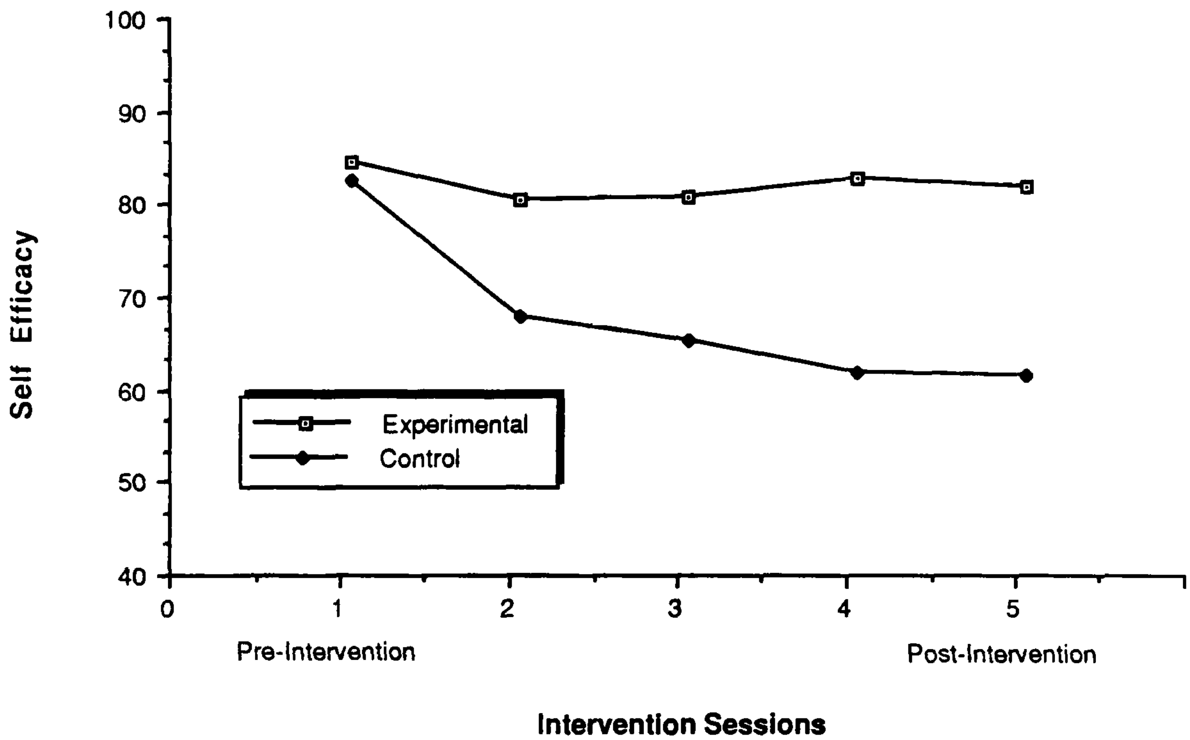
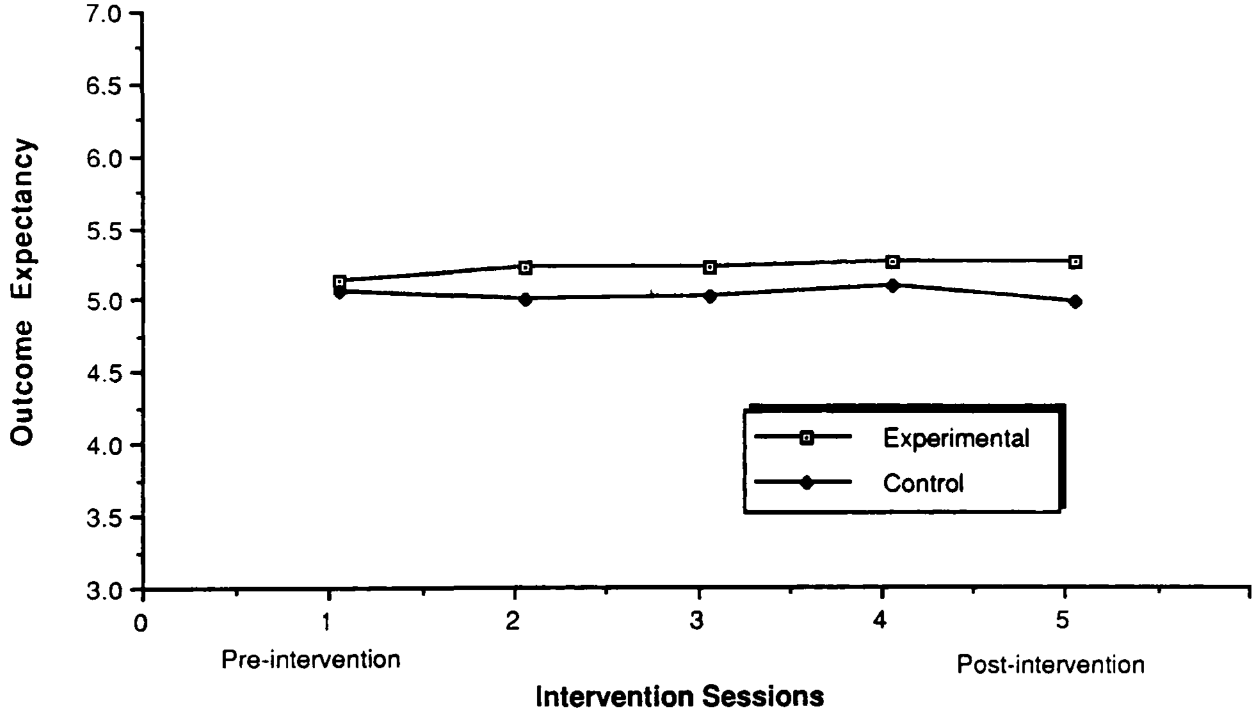


Figure 3. Mean Outcome Expectancy Scores



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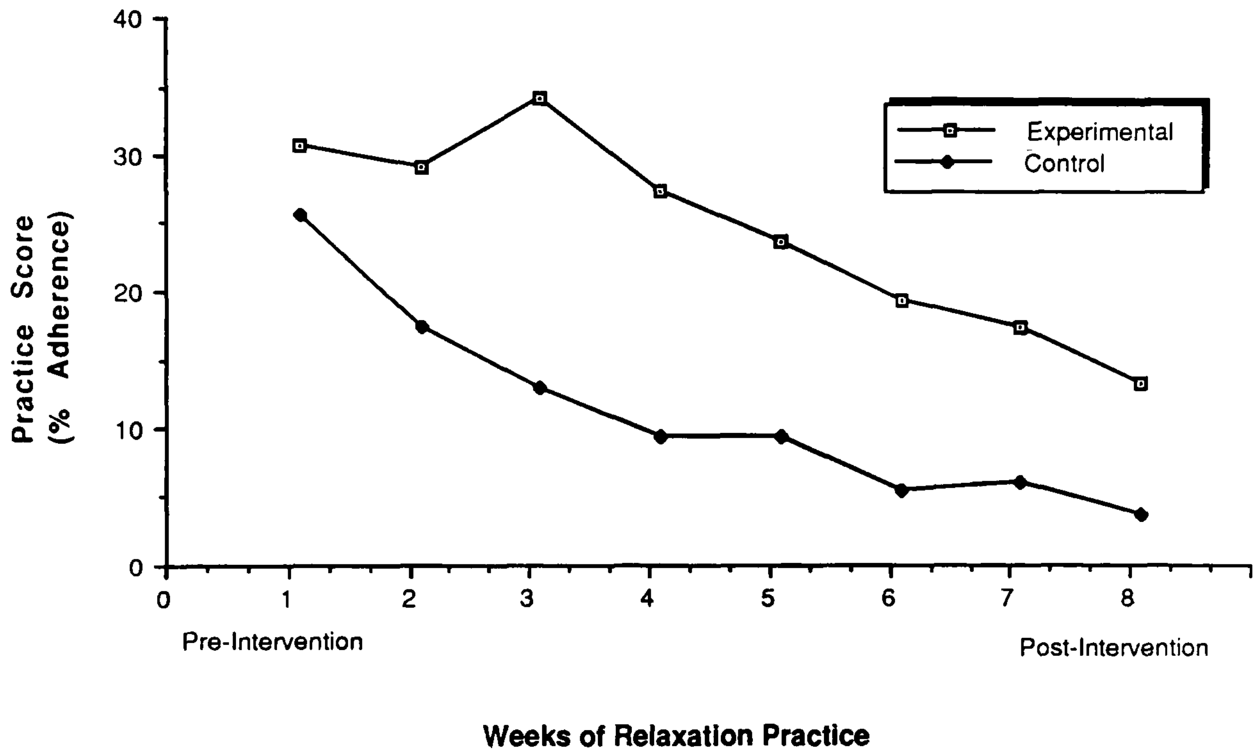


Figure 5. Mean State Anxiety Scores

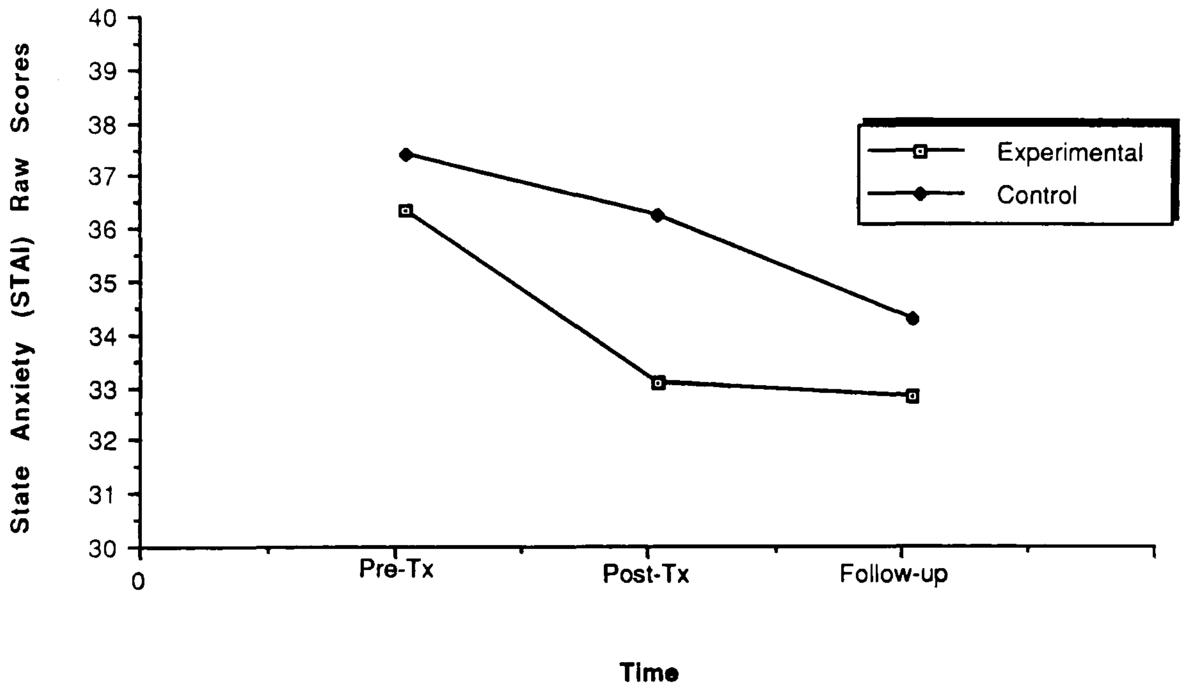
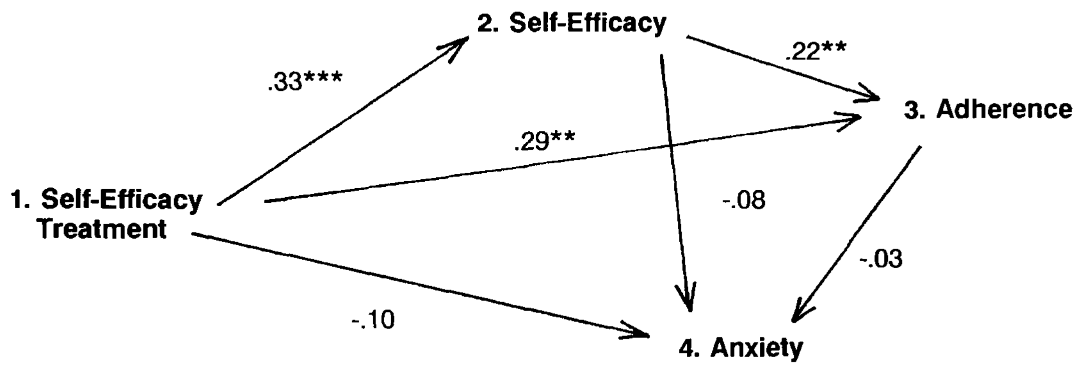


Figure 6

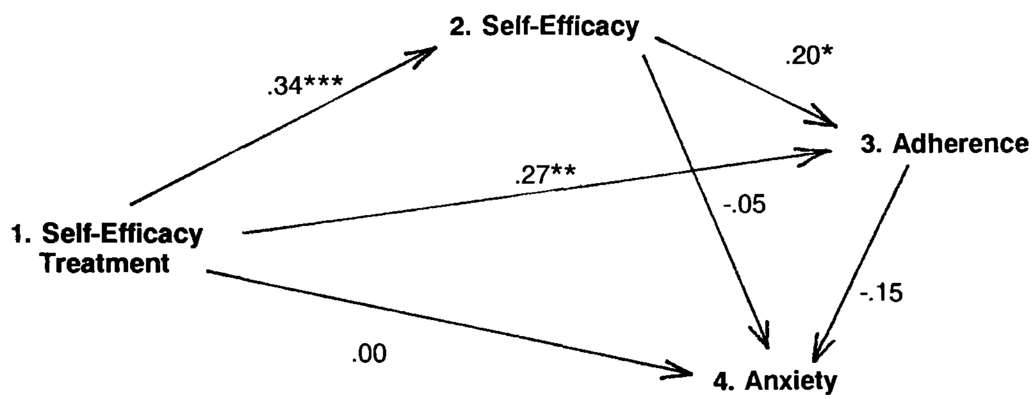
Path Model of Causal Relationships Among Treatment, Self-Efficacy, Adherence and Anxiety at Post-Treatment.



* = p < .05
** = p < .01
*** = p < .001

Figure 7

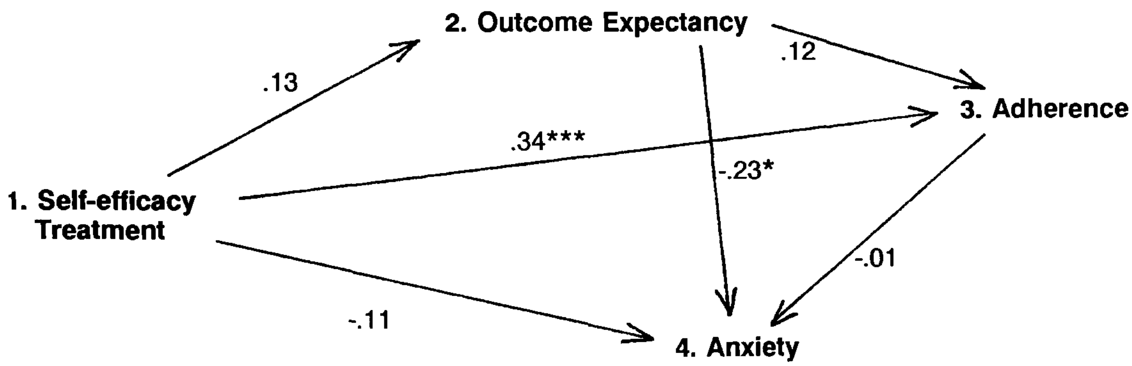
Path Model of Causal Relationships Among Treatment, Self-Efficacy, Adherence and Anxiety at Follow-up.



* = p < .05
** = p < .01
*** = p < .001

Figure 8

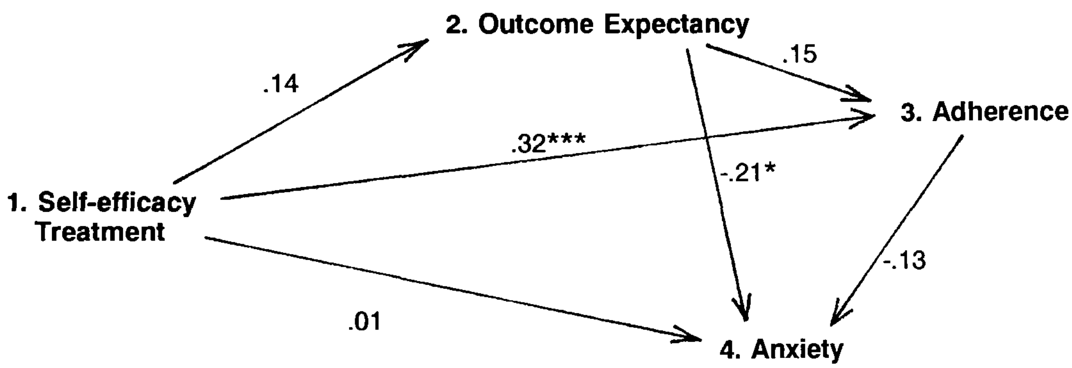
Path Model of Causal Relationships Among Treatment, Outcome Expectancy, Adherence and Anxiety at Post-Treatment.



* = p < .05
** = p < .01
*** = p < .001

Figure 9

Path Model of Causal Relationships Among Treatment, Outcome Expectancy, Adherence and Anxiety at Follow-up.



* = $p < .05$
** = $p < .01$
*** = $p < .001$

Table 1

Descriptive Data and Significance Tests for Age and Pre-Treatment Variables

Variable	Treatment Condition: Experimental (n = 60)	Treatment Condition: Control (n =61)	t[1]	df
Age			.70	119
M	54.81	53.81		
SD	8.44	7.10		
Psychological Distress[a]			.10	119
M	.55	.54		
SD	.55	.49		
State Anxiety[b]			-.51	119
M	36.15	37.24		
SD	11.92	12.18		
Trait Anxiety[c]			.54	119
M	50.91	48.21		
SD	27.30	27.57		
KHOS-B[d]			.61	119
M	3.26	3.02		
SD	2.48	2.06		
MHLC-I[e]			-.04	119
M	4.33	4.34		
SD	.75	.72		
MHLC-P[f]			-1.12	119
M	3.36	3.54		
SD	.80	.95		
MHLC-C[g]			-.10	119
M	2.66	2.68		
SD	.93	.87		
Health Concern			-.11	119
M	7.13	7.18		
SD	2.36	2.32		
Coping			-.49	119
M	7.21	7.39		
SD	2.01	1.95		

[a] Global Severity Index of the Brief Symptom Inventory
[b] State-Trait Anxiety Inventory - State Subscale
[c] State-Trait Anxiety Inventory - Trait Subscale
[d] Krantz Health Opinion Survey - Behavioral Involvement Subscale
[e] Multifactorial Health Locus of Control Scale Internal Subscale
[f] Multifactorial Health Locus of Control Scale - Powerful Others Subscale
[g] Multifactorial Health Locus of Control Scale - Chance Subscale

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1 Note All t-tests are based on pooled variance, p values correspond to two-tailed tests of significance. For all tests shown here, $p > .25$.

Table 2
Descriptive Data for Demographic Variables for Experimental (E) and Control (C) Conditions.

Marital Status

	Single		Married		Divorced/ Separated		
	n	%	n	%	n	%	
E	3	5	53	88	4	7	60
C	2	3	53	87	6	10	61
	5		106		10		121

Educational Level

	Grade School		High School		Technical College		University		
	n	%	n	%	n	%	n	%	
E	4	7	23	38	12	20	21	35	60
C	6	10	25	41	8	13	22	36	61
	10		48			20		43	121

Work Status

	Employed		Unemployed		Retired		Disability Leave		
	n	%	n	%	n	%	n	%	
E	32	53	3	5	13	22	12	20	60
C	33	54	3	5	14	23	11	18	61
	65		6		27		23		121

Current Diagnosis

	MI[a]		CABG[b]		Angina		Arrhythmia		Transplant		Valve Surgery		
	n	%	n	%	n	%	n	%	n	%	n	%	
E	20	73	28	47	11	18	1	2	0	0	0	0	60
C	15	25	31	51	9	15	2	3	1	1	3	5	61
	35		59		20		3		1		3		121

[a] = myocardial infarction
[b] = coronary artery bypass graft surgery

Table 3

Research Subjects and Attriters by Condition

	Subjects		Attriters		
Condition	n	%	n	%	
Experimental	60	73	22	27	82
Control	61	78	17	22	78
	121		39		160

Table 4

Attenders and Non-Attenders by Treatment Session

Condition	Session 1	2	3	4	5	6	7	8
Experimental (n = 60)								
attenders	54	59	56	54	51	49	54	50
non-attenders	6	1	4	6	9	11	6	10
Control (n = 61)								
attenders	56	57	54	54	56	50	51	49
non-attenders	5	4	7	7	5	11	10	12
Total Sample (N = 121)								
attenders	110	116	110	108	107	99	105	99
non-attenders	11	5	11	13	14	22	16	22

Table 5-A

Pairwise Comparisons[a] of Self-Efficacy Means Over Time for Experimental Condition

	Intervention Session				
	1	2	3	4	5
1	----				
2	4.27	----			
3	3.70	-.50	----		
4	1.78	-2.49	-1.99	----	
5	2.81	-1.46	-.95	1.03	----

Self-Efficacy Means: Experimental Condition

	Intervention Session				
	1	2	3	4	5
M	83.69	79.41	79.91	81.90	80.87

[a]Note: two-tailed t-tests (alpha = .05) with Bonferroni alpha correction (comparison-wise alpha = .001), all comparisons are non-significant.

Table 5-B

Pairwise Comparisons[a] of Self-Efficacy Means Over Time for Control Condition

Intervention Session

	1	2	3	4	5
1	----				
2	14.55*	----			
3	17.23*	2.73	----		
4	20.60*	6.10	3.36	----	
5	20.71*	6.21	3.48	.11	----

Self-Efficacy Means: Control Condition

Intervention Session

	1	2	3	4	5
M	81.47	66.97	64.23	60.87	60.75

[a]Note: two-tailed t-tests (alpha = .05) with Bonferroni alpha correction (comparison-wise alpha = .001).

* $p < .05$

Table 6

Multiple Comparisons[a] for Condition by Time Interaction for Self-Efficacy

Time 1 (pre-intervention)	t = .57 n.s.
Time 2	t = 3.21 ***
Time 3	t = 4.06 ***
Time 4	t = 5.44 ***
Time 5 (post-intervention)	t = 5.20 ***

[a] Note: This analysis employed Fisher's protected t-tests.

*** $p < .001$ (one-tailed test).

Table 7

Pairwise Comparisons[a] of Adherence Score Means for Total Sample for Time Main Effect

	Weeks of Relaxation Practice							
	1	2	3	4	5	6	7	8
1	-----							
2	4.89*	-----						
3	4.72	-.18	-----					
4	9.78*	4.88	5.07*	-----				
5	11.68*	6.78*	6.96*	1.90	-----			
6	15.76*	10.86*	11.03*	5.98*	4.07	-----		
7	16.57*	11.57*	11.74*	6.68*	4.78*	.71	-----	
8	19.65*	14.75*	14.93*	9.87*	7.96*	3.89*	3.19*	-----

Adherence Score Means for Total Sample

	Weeks of Relaxation Practice							
	1	2	3	4	5	6	7	8
M	27.39	22.49	22.66	17.61	15.70	11.62	10.92	7.73

[a] Note: using two-tailed t-tests (alpha = .05) with Bonferroni alpha correction (comparison-wise alpha = .001)

* $p < .05$

Table 8

Pairwise Comparisons[a] on Anxiety Score Means Over Time for Total Sample

	Pre-treatment	Post-treatment	Follow-up
Pre-treatment	----		
Post-treatment	1.23	----	
Follow-up	3.32*	1.08	----

Anxiety Score Means for Total Sample

	Pre-treatment	Post-treatment	Follow-up
M	36.70	34.47	33.38

[a] Note: two-tailed t-tests (alpha = .05) with Bonferroni alpha correction (comparison-wise alpha = .001).

* $p < .05$

Table 9

Summary of Path Model Causal Effects for Treatment, Self-Efficacy, Adherence, and Anxiety at Post-Treatment

	Dependent Variables		
	Self-Efficacy	Adherence	Anxiety
Independent Variables			
Treatment			
causal direct effect	.33***	.29**	-.10
causal indirect effect	------	.07	-.04
non-causal effects	------	------	------
Self-Efficacy			
causal direct effect		.22**	-.08
causal indirect effect		------	-.01
non-causal effects		.09	-.04
Adherence			
causal direct effect			-.03
causal indirect effect			------
non-causal effects			-.06

* = p < .05
** = p < .01
*** = p < .001

Table 10

Intercorrelations Among Treatment, Self-Efficacy, Adherence and Anxiety at Post-Treatment

	Treatment	Self-Efficacy	Adherence	Anxiety
Treatment	------			
Self-Efficacy	.33***	------		
Adherence	.36***	.31***	------	
Anxiety	-.14	-.13	-.09	------

* = $p < .05$
** = $p < .01$
*** = $p < .001$

Table 11

Summary of Path Model Causal Effects for Treatment, Self-Efficacy, Adherence, and Anxiety at Follow-up

	Dependent Variables		
	Self-Efficacy	Adherence	Anxiety
Independent Variables			
Treatment			
causal direct effect	.34***	.27**	.00
causal indirect effect	------	.07	-.06
non-causal effects	------	------	------
Self-Efficacy			
causal direct effect		.20*	-.05
causal indirect effect		------	-.03
non-causal effects		.10	-.01
Adherence			
causal direct effect			-.15
causal indirect effect			------
non-causal effects			-.01

* = p < .05
** = p < .01
*** = p < .001

Table 12

Intercorrelations Among Treatment, Self-Efficacy, Adherence and Anxiety at Follow-up.

	Treatment	Self-Efficacy	Adherence	Anxiety
Treatment	------			
Self-Efficacy	.34***	------		
Adherence	.34***	.30***	------	
Anxiety	-.06	-.09	-.16*	------

* = $p < .05$
** = $p < .01$
*** = $p < .001$

Table 13

Summary of Path Model Causal Effects for Treatment, Outcome Expectancy, Adherence, and Anxiety at Post-Treatment.

	Dependent Variables		
	Outcome Expectancy	Adherence	Anxiety
Independent Variables			
Treatment			
causal direct effect	.13	.34***	-.11
causal indirect effect	------	.02	-.03
non-causal effects	------	------	------
Outcome Expectancy			
causal direct effect		.12	-.23*
causal indirect effect		------	-.001
non-causal effects		.05	-.01
Adherence			
causal direct effect			-.01
causal indirect effect			------
non-causal effects			-.08

* = $p < .05$
** = $p < .01$
*** = $p < .001$

Table 14

Intercorrelations Among Treatment, Outcome Expectancy, Adherence and Anxiety at Post-Treatment

	Treatment	Outcome Expectancy	Adherence	Anxiety
Treatment	-----			
Outcome Expectancy	.13	-----		
Adherence	.36***	.17*	-----	
Anxiety	.14	-.24**	-.09	-----

* = $p < .05$
** = $p < .01$
*** = $p < .001$

Table 15

Summary of Path Model Causal Effects for Treatment, Outcome Expectancy, Adherence, and Anxiety at Follow-up.

	Dependent Variables		
	Outcome Expectancy	Adherence	Anxiety
Independent Variables			
Treatment			
causal direct effect	.14	.32***	.01
causal indirect effect	------	.02	-.07
non-causal effects	------	------	------
Outcome Expectancy			
causal direct effect		.15	-.21*
causal indirect effect		------	-.02
non-causal effects		.04	.001
Adherence			
causal direct effect			-.13
causal indirect effect			------
non-causal effects			-.04

* = p < .05
** = p < .01
*** = p < .001

Table 16

Intercorrelations Among Treatment, Outcome Expectancy, Adherence and Anxiety at Follow-up.

	Treatment	Outcome Expectancy	Adherence	Anxiety
Treatment	-----			
Outcome Expectancy	.14	-----		
Adherence	.34***	.19*	-----	
Anxiety	-.06	-.23**	-.17*	-----

* = $p < .05$
** = $p < .01$
*** = $p < .001$

APPENDICES

Appendix A

Outline of Stress Management Intervention Sessions 1 to 7

SESSION 1

Major goals:

1) Therapist creates environment in which patients are able to disclose own ideas about stress in general and personal stressors;

2) Set up treatment as a collaborative, participatory, and educational endeavour;

3) Start work on reconceptualization of stress/tension;

4) Use patients own experiences as a focus for discussion;

5) Outline the stress management programme.

Content:

1) Introductions

2) Therapist leads discussion on rationale for stress management

3) Therapist and patients together define stress, focus is on general life stress

4) Therapist introduces transactional model of stress

5) Therapist and group discuss stress-related problems and symptoms from a situational and behavioral perspective

6) Therapist links transactional stress and coping reconceptualization to patients stress responses

7) Therapist outlines content of sessions to follow

8) Therapist gives homework assignment: self-monitoring exercise

SESSION 2

<u>Major goals</u>:

1) Introduce the autonomic nervous system (ANS)

2) Introduce self-control via breathing exercise

<u>Content</u>:

1) Discuss homework assignment.

2) Physical stress response factors: ANS responses: sympathetic

3) The relaxation response: parasympathetic

4) Breathing

5) Breathing exercise

6) Therapist gives homework assignment: controlled breathing exercise and self-monitoring exercise

SESSION 3

Major goals:

1) How we learn to respond to stress maladaptively; and
2) Introduction to progressive muscle relaxation

Content:

1) Discuss homework assignment
2) How we learn to become stressed: classical conditioning and operant learning
3) The role of muscle tension in the stress response
4) How relaxation works
5) Progressive muscle relaxation exercise: taught to patients
6) Therapist gives relaxation practice prescription

SESSION 4

Major goals:

1) Describe cognitive and affective components of stress reactions.

2) Develop awareness of the occurrence and impact of automatic dysfunctional cognitions versus coping cognitions.

Content:

1) Homework is reviewed.

2) The psychological components in stress: cognition and affect

3) Cognition, cognitive appraisal and stress

4) Automatic thoughts exercise: to teach awareness of the central role of cognitive appraisal (the evaluative, expectational, interpretative and imaginal aspects of cognition).

5) Relaxation training session.

6) Relaxation practice prescription.

7) Homework assignment: Daily record of dysfunctional cognitions associated with stress reactions/stressful encounters.

SESSION 5

Major goals:

1) Review daily record of dysfunctional cognitions exercise to ensure that patients know how to do this.

2) Teach modifications of dysfunctional cognitions based on testing their veracity.

Content:

1) Review homework assignment.
2) Therapist teaches techniques of modifying cognitions.
3) Relaxation training session.
4) Relaxation practice prescription.
5) Homework assignment: modifying dysfunctional cognitions.

SESSION 6

<u>Major goals</u>:

1) Enhance patients skills in changing dysfunctional cognitions

<u>Content</u>:

1) Review homework exercise in great depth
2) Teach concepts of thinking errors which perpetuate dysfunctional cognitions
3) Relaxation training session
4) Relaxation practice prescription

SESSION 7

Major goal:

1) Assertiveness training.

Content:

1) Discuss stressors associated with interpersonal communication.

2) Identify vectors of communication behaviours: passive - aggressive

3) Identify patient's strengths and weaknesses in vectors across situations

4) Role playing of appropriately assertive behaviour in problem situations

Appendix B

Treatment Manual: Experimental Intervention Sessions 4 to 7

SESSION 4

[ask for patients experiences with the relaxation exercise]

- what was it like for you to practice the relaxation exercise last week?

[for patients who report intrusive thoughts or wandering attention say the following:]

- this is normal, many people have this difficulty early on, just allow your attention to go back to the tape, one way of doing this is to actually give yourself permission to spend this period of time doing the exercise.

[answer any technical questions that patients may have about the exercise]

[for those who experienced strange sensations: tingles, pins and needles, warmth heaviness/lightness of limbs, or noticed tension that they could not get rid of say the following:]

- some people experience different physical sensations during the exercise, these sensations often are indications that you are becoming more relaxed, unless the sensations you experience are painful or cause you distress you do not need to worry.

  last week we suggested that you practice the exercise twice a day

- we know from experience that it is difficult for most people to be consistent in practicing twice a day so they come back feeling a bit guilty about not practicing, or begin to think that the relaxation exercise is really not for them.

- There are a number of good reasons behind problems practicing:
  hard to find the time, or forgetting to do it
  - too many interruptions
  - tried it once or twice and it didn't seem to do any good
  - had trouble concentrating

  what kinds of problems did you have when you tried to practice the relaxation exercise last week?

- because practice is essential to benefit from the exercise, we are going to spend some time working on overcoming some of the blocks to regular practice.

- let's start with finding two time periods a day for practice, how did you go about deciding when you would practice last week?

- one way of choosing times that are reasonable is to structure your practice ahead of time.

- this is like setting a short-term goal for yourself that is based on what you know will be coming up for you and the kind of interruptions you would likely face.

[pass out the practice time worksheet]

- this worksheet will help you structure the times for your practice, we will work through it together now.

each day is broken down into three periods, morning, afternoon and evening

depending on what you know about the demands made on your time, and what free time you will be able to make available for yourself, for each day mark two 20 minute chunks of time when you think the chances of your being able to practice will be highest.

instead of thinking about the long range goal of being able to relax completely, we would like you to think about your practice on a week-to-week basis.

practicing twice a day is something to aim for, if you do not reach that goal every day it doesn't mean that you are a failure, but it is a good indication that you need to do something differently in order to be able to practice sufficiently.

SESSION 5

- what was it like for you to practice the relaxation exercise last week?

[answer any technical questions that patients may have about the exercise]

- we often find that people tend to focus on how good they are at being able to become relaxed before they have practiced enough to get any benefit from it.

  this leads them to give up practicing, which of course means that they will not likely perceive any benefits.

  for now, just try to focus on the idea that you are learning a new skill, at this point in time don't worry about how successful you are.

  for example, if you were told that you had to change your diet, would you expect to be able to do this perfectly and see results from the first week?
  probably not, you would have to learn a bunch of new skills (what kind of food to buy, how to prepare it etc.), you would need to stay on the diet, and it would take time for results to become evident.

  its the same with relaxation, the skill develops gradually over time with consistent practice.

  the key is in being able to practice regularly, this means developing a practice habit.

  at the start its difficult to practice regularly, but breaking down practice into several smaller tasks can help you be successful.

  last week we talked about scheduling a time and place, today we will go a step further and look at ways of dealing with interruptions and other blocks to practice

[therapists help patients identify situations that put them at high risk for not practicing the relaxation exercise]

  what would you say was the main reason for not practicing the relaxation exercise during the times you scheduled for practice?

  although some episodes of missed practice are triggered by motivational problems, many are triggered by external factors that work against relaxation practice.

  to start with, we'll talk about the factors outside of yourself.

  what kinds of events were going on around you that may have influenced your ability to actually practice the exercise?

[put these blocks on the board]

  the kinds of situations and events you have brought up can certainly get in the way of your practicing the exercise

  one way of dealing with things that get in the way of practice is to develop a strategy to deal with them ahead of time.

  you have already come up with some specific blocks to practice, what can you do to deal with them so that you would be able to practice?

[therapists help patients develop coping strategies to deal with those situations, involve group as much as possible put the alternatives on the board beside the blocks. If it really is impossible to practice, patients should contract with self to do it at a specific time later. Deal with interruptions by choosing a time where others will not be around, or inform others that you need 20 minutes to yourself etc. For those who feel they have too many other important things to do instruct them to give themselves permission to take the time required i.e. that it isn't being lazy/irresponsible]

the internal factors that can get in the way of our attempts to practice relate to our beliefs about the relaxation exercise and our ability to actually do it effectively.

expecting immediate results from the technique or yourself can lead to discouragement, remember that developing voluntary control over your level of tension will take time.

if you happen to experience a significant stress response while you are still learning the basic relaxation skill, you may interpret this as meaning either that relaxation is not beneficial, or that you are no good at doing it. These kinds of interpretations can lead to decreased motivation, decreased motivation leads to less practice, and less practice means that you will not learn the skill well enough for it to be useful.

[Therapists elicit patients perceptions of the benefits of the exercise for themselves and patients self-image in relation to relaxation skills]

at this point in time what do you see as the benefits of the relaxation exercise for you?

do you see yourself as the kind of person who will be able to get any benefit from the relaxation exercise

[pass out the practice time worksheet]

this worksheet will help you structure the times for your practice, we will work through it together now.

- depending on what you know about the demands made on your time, and what free time you will be able to make available for yourself, for each day mark two 20 minute chunks of time when you think the chances of your being able to practice will be highest.

SESSION 6

[therapists work how not practicing the relaxation exercise could affect cognitions, feeling state, and expectancy for the benefit of the exercise]

- you have been working on becoming aware of automatic thoughts that affect your stress level, automatic thoughts also have influence on whether we persist at learning the relaxation skill.

- at times when we find it difficult to practice, when we forget to practice, or when doing the exercise has not had a significant benefit, we make evaluations about ourselves, our ability to learn the technique, and how good the technique is.

[lead group in exercise to develop list of non-adherence cognitions]

think back to times when you have not been as successful as you'd like to be with practicing the relaxation exercise, what kinds of automatic thoughts might you have had about:

- your ability to learn the technique

- your level of motivation and self-discipline to practice

- the usefulness of the technique

- the benefit of the technique for yourself

[the following are self-defeating, incorrect cognitions that therapists can probe for and then challenge - "I knew I'd never be able to practice relaxation the way I should, I've not got the skills/ability, I've not got the willpower, the treatment is no good, I don't have the time."]

- now how likely is it that you will make the effort to keep on practicing the exercise if you have these kinds of thoughts about it and/or your ability to do it?

  we often find that these kinds of automatic thoughts are what keep people from being able to practice consistently enough.

[therapists help patients revise automatic thoughts and beliefs that get in the way of practice i.e., "because I have low motivation", or "because I didn't practice relaxation as I was supposed to the treatment has failed and I am no good at managing stress."]

- let's spend some time coming up with revised statements for these automatic thoughts

  periodically not practicing is normal in the process. You are trying to make an adjustment in your life by developing self-control and changing some of your habits to allow this to happen, so there is a lot going on that can influence relaxation practice

- experiencing conflict over practice is not entirely a negative event, rather, it signals the need for an effective coping response

  for example, the automatic thoughts "I have too much to do, there is no way I can practice today, its not really important to practice today, I've practiced enough already" are a way of resolving a conflict about practice", are a signal for active coping rather than reasons for passive yielding and giving up.

SESSION 7

- you have learned the relaxation exercise. Relaxation will become a skill through regular practice. We have discussed ways of coping with situations when it is difficult to practice.

  when your relaxation practice is blocked, it is important to use your problem solving and coping skills to overcome the obstacles and maintain your level of practice.

- missed practice could be the start of continued missed practice and potential loss of benefit from the relaxation program. It can also be regarded as a challenge or an opportunity to develop new coping skills by understanding what went wrong and how to remedy the problem. We have talked about a variety of different ways to get back on the track or regular practice and developing alternative strategies such as scheduling or finding a private spot to practice.

[therapists lead brief discussion on the strategies patients will use to stay with relaxation practice, try and get at patients self-perceptions of their ability to stay with it and intervene at the level of appraisal of the importance of using the tape and of their automatic thoughts about their own ability, motivation, expectations etc.]

- what kinds of problems have you noticed yourself having when it comes to keeping up with regular practice?

- what kinds of things have you been doing to try and overcome those blocks?

  what do you think is related to your not putting out the effort toward overcoming the blocks?

  often we find that these problems are related to our automatic thoughts about the exercise and ourselves. When you think about relaxation practice what are he immediate thoughts you have about practicing with the tape?

[therapists work toward realistic expectations of self, and the exercise]

  the goal is to prevent setbacks from escalating into the situation where we completely stop relaxation practice.

Appendix C

Adherence Measure: Relaxation Practice Monitor (RPM)

1. General Description

The RPM was developed to provide an unobtrusive, objective measure of adherence to progressive muscle relaxation practice. The RPM is a conventional Sony TCM 737 portable cassette tape recorder with a relaxation tape sealed in the tape compartment and an electronic timing and memory circuit housed in the battery compartment secured with small tamper proof screws. The entire circuit is powered by a 9 volt alkaline battery. The external appearance of the tape recorder remains unaltered. The RPM measures and records, in real time, the amount of time the relaxation tape is played. Practice time is measured in minutes per hour for up to 2047 hours.

The RPM as a measure of compliance is not perfect. However, it appears to be the best measure currently available to gather the type of data sought by the study. The RPM provides a direct measure of adherence to the prescribed regimen, it is objective and unobtrusive. However, there are three potential sources of error in the data to be collected by the machine. First, some patients may guess the true nature of the RPM and create false practice data by routinely playing the machine and not practicing. Second, an individual other than the patient may use the recorder to try out the relaxation procedure, which would result in an inaccurate measure of the patients compliance. Third, a given patient may prefer to practice without the tape, resulting in an erroneous adherence score. These potential problems were dealt with as follows: prior to the study it was decided that the data for patients who discovered that their practice was being monitored would be would not be used in the analysis; patients were told that the machines should be used exclusively by them; and instructed that practice with the tape as prescribed was an essential and integral part of the treatment programme.

Because adherence was defined in this study as practicing the complete relaxation exercise twice-daily with the tape, the RPM data provides a sensitive outcome measure. Yet, in a broader clinical sense, the amount of time patients spend practicing (whether they complete the taped exercise or not, may be relevant to treatment outcome. Therefore, counting only completed tape plays is likely a conservative criterion. If adherence were to be defined as the total amount of practice time, minutes of tape use would be a more sensitive measure. The definition used in this study likely identifies more false negatives compared to a more liberal definition, but yields fewer false positives.

2. Technical Description

Refer to the simplified block diagram. The crystal timebase provides a single pulse at the end of every minute and every hour. A minute counter is enabled and increments once every minute when the relaxation tape is played. The hour pulse does three things in sequence: it transfers the contents of the minute counter into memory; it clears the minute counter; and it increments the memory address counter so that the next data from the minute counter is stored in the next memory location. This cycle repeats itself at the end of every hour.

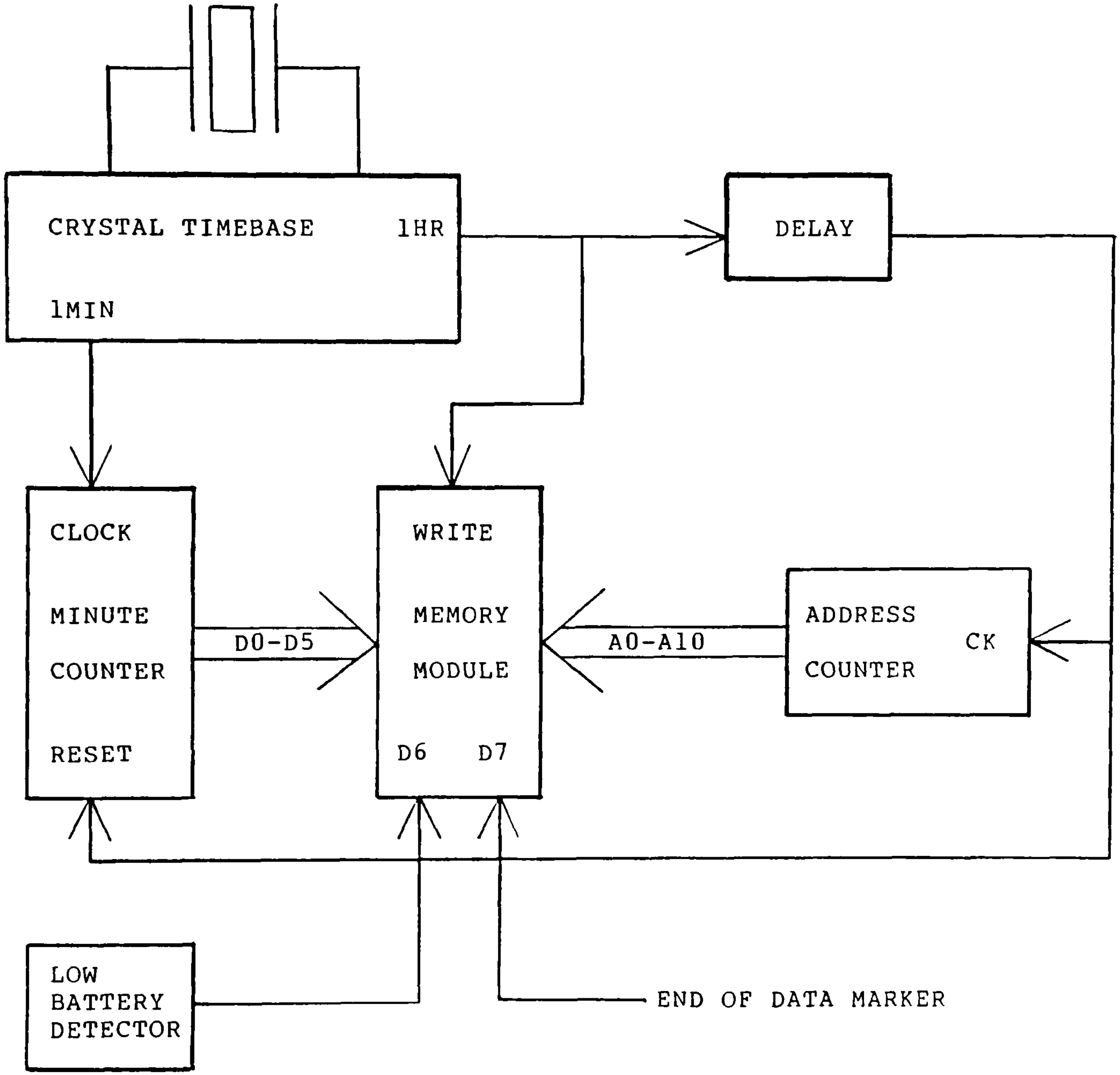
3. RPM Circuit Design

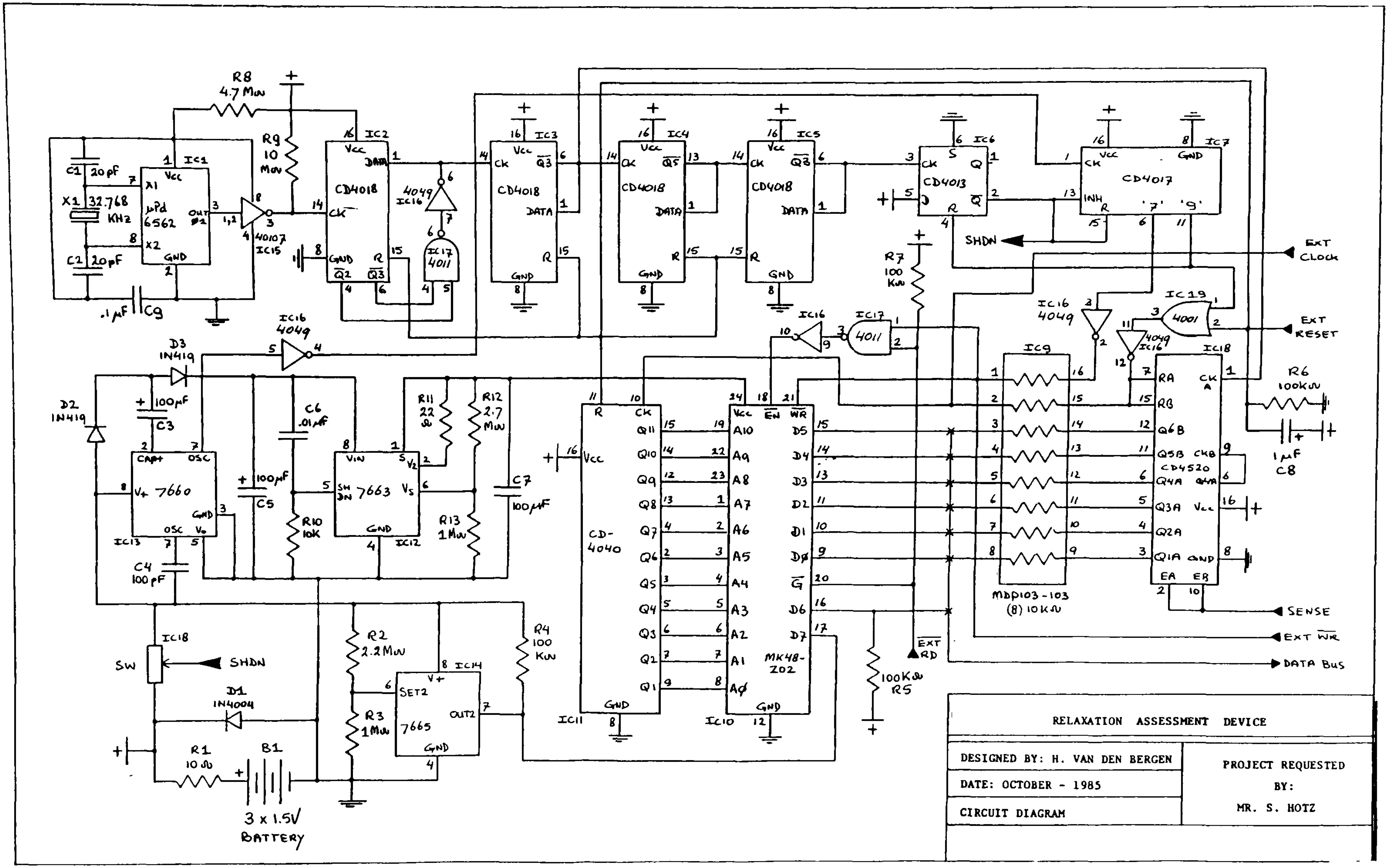
The power consumption of the RPM has been kept to a minimum. All logic functions are performed by CMOS integrated circuits which operate directly from one 9 volt cell. A crystal controlled timebase is used to control all timing functions. Since data are collected only at hourly intervals, some of the circuitry does not need to be powered up all the time. Thus, the memory, low battery detection circuit, the voltage doubler and the voltage regulator are powered up for only 10 msec. per hour reducing the average power consumed by these circuits to a negligible amount. Refer to the circuit diagram.

To prevent data loss due to premature battery failure a non-volatile memory is used. This memory can be powered down without any resulting data loss. In fact, the memory is totally removed from the RPM for the purpose of reading its contents. To facilitate this, an easily accessible zero insertion force socket is mounted in the battery compartment. Moving a small lever releases the memory. As an added precaution, battery status is recorded simultaneously with data at the end of each hour.

4. The Reader Circuit

Relaxation practice data is read from the memory by a reader circuit. This is a stand-alone electronic device into which the RPM memory circuit is inserted. The reader has been designed to interface with a microcomputer which, with specially designed software, allows for the formatting of the data in a variety of layouts.


CRYSTAL TIMEBASE
1HR
1MIN
DELAY
CLOCK
MINUTE
COUNTER
RESET
D0-D5
WRITE
MEMORY
MODULE
D6
D7
A0-A10
ADDRESS
COUNTER
CK
LOW
BATTERY
DETECTOR
END OF DATA MARKER



Circuit Diagram

Appendix D **Self-Efficacy Questionnaire**

Practicing the progressive muscle relaxation exercise involves following recorded instructions using the tape recorder you have been given. To practice the exercise once takes about 20 minutes.

Instructions:

Beginning with the first item below, under the CAN DO column, check (✓) each item on the list that corresponds to how many times you believe you are capable of practicing the relaxation exercise during the next week. Proceed through the items until you reach the amount of practice that you do not feel you are capable of achieving.

Then, beside each item that you have checked CAN DO, indicate in the CONFIDENCE column how confident you are in being able to practice the exercise that many times. Rate your confidence by recording a number from 10 to 100 using the scale below.

10	20	30	40	50	60	70	80	90	100
quite uncertain				moderately certain					certain

Remember, do not answer how many times you intend to practice. Just mark your answers based on how often you honestly believe you will actually be able to practice.

If you were asked to practice the exercise during the next week how many times would you actually be able to practice, and how confident are you in being able to practice the exercise that many times?

I feel capable of practicing the relaxation exercise, with the tape,	CAN DO	CONFIDENCE
at least ONE time this week	______	______
at least TWO times this week	______	______
at least THREE times this week	______	______
at least FOUR times this week	______	______
at least FIVE times this week	______	______
at least SIX times this week	______	______
at least SEVEN times this week (once a day)	______	______
at least EIGHT times this week	______	______
at least NINE times this week	______	______
at least TEN times this week	______	______
at least ELEVEN times this week	______	______
at least TWELVE times this week	______	______
at least THIRTEEN times this week	______	______
at least FOURTEEN times this week (twice a day)	______	______

Appendix E **Outcome Expectancy Questionnaire**

This questionnaire asks you what you think about different parts of the stress management programme. Beside each statement is a scale which ranges from Completely Disagree (1) to Completely Agree (7). Mark your answer by circling the number on the scale which reflects what you believe right now. Do not circle more than one choice for each statement. Please read each of the following statements carefully. There are no right or wrong answers. Base your answers on what you actually believe right now.

1. By practicing the relaxation exercise 2 times a day with the tape I will be better able to manage my emotional reactions to stressful experiences (for example: feel less anxious, less angry, and more in control of my emotions).

1	2	3	4	5	6	7
Completely Disagree						**Completely Agree**

2. This stress management programme will help me feel less stressed.

1	2	3	4	5	6	7
Completely Disagree						**Completely Agree**

3. By practicing the relaxation exercise 2 times a day with the tape I will be better able to manage my physical reactions to stressful experiences (for example: reduce my heart rate, muscle tension and blood pressure).

1	2	3	4	5	6	7
Completely Disagree						**Completely Agree**

4. The relaxation exercise will help me reduce my level of stress.

1	2	3	4	5	6	7
Completely Disagree						**Completely Agree**

5. At the end of this stress management programme I will be able to better manage my physical reactions to stressful experiences (for example: reduce my heart rate, blood pressure and muscle tension).

1	2	3	4	5	6	7
Completely Disagree						**Completely Agree**

6. At the end of this stress management programme I will be able to better manage my emotional reactions to stressful experiences (for example: feel less anxious, angry, and more in control of my emotions).

1	2	3	4	5	6	7
Completely Disagree						**Completely Agree**

Appendix F **Krantz Health Opinion Survey Questionnaire**

The following statements ask for your opinion about different kinds of health care. For each statement below, decide whether you agree or disagree and circle the answer which best fits your opinion. Each person is different, so there are no "right" or "wrong" answers. Circle an answer for each statement, don't leave any blank. Even if you find you don't completely agree or disagree with a statement, choose the one answer that comes closest to what you believe.

1. I usually don't ask the doctor or nurse many questions about what they're doing during a medical exam. **AGREE/DISAGREE**

2. Except for serious illness, it's generally better to take care of your own health than to seek professional help. **AGREE/DISAGREE**

3. I'd rather have doctors and nurses make the decisions about what's best than for them to give me a whole lot of choices. **AGREE/DISAGREE**

4. Instead of waiting for them to tell me, I usually ask the doctor or nurse immediately after an exam about my health. **AGREE/DISAGREE**

5. It is better to rely on the judgements of doctors (who are experts) than to rely on "common sense" in taking care of your body. **AGREE/DISAGREE**

6. Clinics and hospitals are good places to go for help since it's best for medical experts to take responsibility for health care. **AGREE/DISAGREE**

7. Learning how to cure some of your illness without contacting a physician is a good idea. **AGREE/DISAGREE**

8. I usually ask the doctor or nurse lots of questions about the procedures during a medical exam. **AGREE/DISAGREE**

9. It's almost always better to seek professional help than to try to treat yourself. **AGREE/DISAGREE**

10. It is better to trust the doctor or nurse in charge of a medical procedure than to question what they are doing. **AGREE/DISAGREE**

11. Learning how to cure some of your illness without contacting a physician may create more harm than good. **AGREE/DISAGREE**

12. Recovery is usually quicker under the care of a doctor or nurse than when patients take care of themselves. **AGREE/DISAGREE**

13. If it costs the same, I'd rather have a doctor or nurse give me treatments than to do the same treatments myself. **AGREE/DISAGREE**

14. It is better to rely less on physicians and more on your own "common sense" when it comes to caring for your body. **AGREE/DISAGREE**

15. I usually wait for the doctor or nurse to tell me about the results of a medical exam rather than ask them immediately. **AGREE/DISAGREE**

16. I'd rather be given many choices about what's best for my health than to have the doctor make the decisions for me. **AGREE/DISAGREE**

Appendix G

Quality of the Data

1. Missing Data

Subjects who did not attend a data collection session were followed-up and asked to complete the relevant measures within two days of the missed session. Consequently, there was a relatively low rate of missing data, in spite of the repeated measures design and an outpatient sample. Missing data resulted only from the inability of the research assistant to contact patients to complete measures, or the completion of measures more than two days following a measurement timepoint. A total of 17 patients (10 controls, 7 experimental) had missing data on the self-efficacy and outcome expectancy measures, and 11 patients had missing data for either the post-treatment or follow-up measures (3 controls and 8 experimentals). The pattern of missing data was analyzed using BMDPAM (BMDP, 1985). BMDPAM results revealed no differences between groups with and without missing data on such variables as age, psychological distress (GSI), state anxiety, preference for self-involvement in health care, adherence to relaxation practice, outcome expectancy or self-efficacy. This suggests that the pattern of missing data was essentially random. Given that patients with missing data were actively followed-up, no test to determine whether there was any difference in proportion of missing data between experimental and controls was carried out. Because the proportion of missing data was quite small, missing data were estimated by inserting the mean value, of the specific treatment group to which the patient belonged, for the data point. This relatively conservative procedure was chosen because it retains the original mean for the distribution of scores for each treatment group for the variable in question (Tabachnick & Fidell, 1983; Cohen & Cohen, 1983).

2. Normality

Analyses of the data to determine whether they met the assumptions of normality were carried out by treatment condition using the condescriptive procedure in $SPSS^X$ with histogram overlays. Although not perfectly normal, the distributions of scores on the variables self-expectancy, outcome expectancy, state anxiety, multifactorial health locus of control, and preference for self-involvement in health care were within acceptable limits of skewness and kurtosis. Of note is that the adherence scores for the treatment conditions were moderately positively skewed. These data were not transformed for the following reasons. First, as the primary dependent measure in this study, adherence was measured in meaningful units (Tabachnick & Fidell, 1983). Second, regarding ANOVA of means, the effects of departures from normality (and effects of inequality of variance) do not serve to seriously invalidate inferences when n's are equal, given the robustness of the procedures (Scheffe, 1959; Lindmann, 1974; Neter & Wasserman, 1974; Miller, 1986).

3. Outliers

Univariate outliers were searched for using the condescriptive procedure in $SPSS^X$ (SPSS Inc., 1986). Data for each condition were examined separately to avoid destroying treatment-caused differences between conditions. Scores below z scores of -3.00 and above z scores of +3.00 were identified and reduced to their maximum z score equivalents. This strategy was employed to preserve the distinctiveness of these cases. A total of 9 univariate outliers were identified on such variables as adherence, state anxiety and outcome expectancy. After univariate outliers had been dealt with, multivariate outliers were searched using BMDPAM and variables responsible for extreme scores were identified using BMDP1D. Four outliers were identified and their scores on such variables as adherence, self-efficacy and outcome expectancy were recoded to the appropriate upper and lower z score bounds in order to retain these subjects in the analysis and preserve the distinctiveness of their scores.

Appendix H

Means and Standard Deviations of Self-Efficacy Scores Across Intervention Sessions.

Condition	Intervention Sessions 1	2	3	4	5
Experimental					
M	83.69	79.41	79.91	81.90	80.87
SD	26.93	26.83	26.50	29.32	24.68
Control					
M	81.47	66.97	64.23	60.87	60.75
SD	31.13	28.89	29.85	30.45	31.49

Appendix I

Means and Standard Deviations of Outcome Expectancy Scores Across Intervention Sessions.

	Intervention Sessions				
Condition	1	2	3	4	5
Experimental					
M	5.07	5.17	5.16	5.20	5.12
SD	.69	.61	.64	.61	.68
Control					
M	4.99	4.94	4.97	5.03	4.92
SD	.65	.66	.72	.71	.77

Appendix J

Means and Standard Deviations of Weekly Adherence Scores

	Relaxation Adherence by Weeks							
Condition	1	2	3	4	5	6	7	8
Experimental								
M	30.00	28.45	33.45	26.71	22.85	18.69	16.66	12.61
SD	25.56	29.50	33.07	30.38	30.38	23.04	23.21	19.65
Control								
M	24.82	16.62	12.06	8.65	8.66	4.68	5.26	2.92
SD	21.04	21.17	19.67	14.16	18.72	9.02	8.54	6.16

Appendix K

Means and Standard Deviation of State Anxiety Scores at Pre-Treatment, Post-Treatment and Follow-up

Condition	Pre-treatment	Post-treatment	Follow-up
Experimental			
M	36.15	32.86	32.63
SD	11.92	10.03	10.02
Control			
M	37.24	36.05	34.11
SD	12.18	11.82	13.05