THE INFLUENCE OF SELF-EFFICACY AND SOCIAL SUPPORT ON RECOVERY POST-MYOCARDIAL INFARCTION

by

© Diana E. Clarke

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A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF ARTS

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ABSTRACT

It has been theorized that a spouse's notions about the patient's physical capabilities after a myocardial infarction (MI) can enhance or retard the physical and the psychological recovery process. The present research examined the possible influence of a wife's confidence in her husband's abilities post-MI as well as the individual patient's confidence in himself on the process of recovery.

Individuals entering a community-based rehabilitation program for post-MI patients were asked to complete a self-efficacy questionnaire for cardiac patients and a scale of perceived social support at time of recruitment as well as at a four-month re-evaluation visit. Results of the subjects' baseline and re-evaluation treadmill tests on heart rate and blood pressure, maximum metabolic equivalents (METs) achieved and electrocardiographic evidence of myocardial ischemia were recorded. Subjects' wives were also approached about completing the efficacy questionnaire regarding their perception of their husbands' abilities. Those completing the questionnaire were asked if they wanted to experience a treadmill test themselves. Those agreeing were randomly assigned to either receive or not receive a test.

Patients' self-efficacy scores were found to be highly correlated with METs at baseline and at re-evaluation. Confidence expressed by wives was significantly related to METs at baseline but not at re-evaluation. Self-efficacy scores were significantly related to spouses' confidence and total social support scores both at baseline and at re-evaluation. The self-esteem subscale of social support was found to be related to self-efficacy only at re-evaluation. This may indicate that, while spousal confidence appears to be important early in recovery, long-term recovery seems to be dependent upon the individual's confidence in himself.

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INTRODUCTION

The heart holds a central role in our culture symbolizing goodness and bravery. A kind, compassionate person has a "good heart". The heart can be "filled with joy" or "heavy with grief". Thus, when an individual sustains damage to the heart, as in a myocardial infarction (MI), there has been not only a physical insult to the body, but also an emotional insult to the psyche, an "ego infarction" (Cassem & Hackett, 1973). In addition, the individual has just survived a threat to mortality and is faced with, at best, life with a chronic illness and, at worst, the possibility of future sudden death. The psychological trauma further extends to those in the patient's life -- spouse, family and friends -- who have themselves experienced the psychological trauma of almost losing a loved one, but who can also directly or indirectly influence how the patient feels about him/herself, and thus ultimately influence physical and psychological recovery.

This investigation examined the relationship between the psychological variables of social support and self-efficacy and physical performance on a treadmill eight to ten weeks post-MI and again after four months in a cardiac rehabilitation program. Changes in the patients' perception of support and self-efficacy as well as changes in spousal estimates of efficacy resulting from the spouses' experience with treadmill testing were also examined.

CORONARY ARTERY DISEASE

Heart disease is the major cause of death in both men and women in North America (Williams & Wallace, 1983). Coronary artery disease (CAD), the occlusion of one or more coronary arteries caused by the development of arteriosclerosis, is the most frequently fatal type of heart disease when it results in an MI (Williams & Wallace, 1983). CAD is also referred to as arteriosclerotic heart disease (ASHD) or ischemic heart disease (IHD) with all three terms used interchangeably.

There are a number of physiologic risk factors which are associated with the development of CAD (Brand, Rosenman, Scholtz & Friedman, 1976). The risk of CAD increases with increasing age. Arteriosclerosis, the thickening and hardening of vessel walls, is part of the normal aging process. Sex also interacts with age to put younger males at higher risk than younger females. At ages under 55 years, males are at a six-fold higher risk than females, although after menopause men and women are at equal risk (Williams & Wallace, 1983). A persistantly elevated blood pressure of $\geq$ 160/95 puts continuous strain on vessel walls and has been shown to increase the risk of CAD relative to individuals with blood pressures $\leq$ 140/90. Elevated hematocrit (thickened blood) and elevated levels of plasma lipids, cholesterol, triglycerides and free fatty acids can contribute to arteriosclerotic plaque formation and are associated with increased risk of CAD. There is

a positive relationship between obesity (weight > 20% over ideal body weight) and development of CAD although the relationship may be indirect (as through hypertension). Finally, smoking, through vasoconstriction, causes an increased workload for the heart and can increase the risk of CAD by 75% in comparison with non-smokers (Williams & Wallace, 1983).

Psychological factors also appear to be associated with the development of CAD and its progression to MI. Stress and life changes have been shown to correlate with CAD even when conventional risk factors are controlled (e.g., Krantz, Baum & Singer, 1983; Orth-Gomar & Ahlbom, 1980; Syme, 1975). Further, a "coronary-prone" behavior pattern has been identified through two prospective epidemiological studies involving almost 9,000 American men and women: The Framingham Study and the Western Collaborative Group Study (see Brand et al, 1976). In addition to confirming the association of the previously mentioned risk factors with development of CAD, there emerged a description of a behavior pattern that seemed to be associated with a higher risk of CAD. Entitled the Type A Behavior Pattern (TABP), it is characterized by an individual who is ambitious, aggressive, competitive and impatient. Specific behaviors such as alertness, muscle tenseness, rapid and emphatic speech stylistics and emotional reactions such as enhanced irritation and expressions of anger are also exhibited (Rosenman & Chesney, 1985). It has been theorized that the manifest expression of hostility may be

motivated by an inadequate level of self-esteem and need for control (Powell, 1984). Type B individuals, on the other hand, are described as relaxed, deferent and satisfied and often respond less to the same levels of challenge that elicit TABP (Rosenman & Chesney, 1985). In a cross-section of the Framingham Study, it was found that in women under age 65, high scores on the emotional lability, tension and anger scales, characteristics of TABP, were associated with a higher prevalence of CAD whereas in men under age 65, aging worries, daily stress and tension were associated with higher occurrence of MI (Haynes, Feinleib, Levine, Scotcher & Kannel, 1978).

Recent studies have demonstrated a further association in men between TABP, CAD and the behavior patterns of their wives. In one study, TABP individuals whose wives were dominant, active and highly educated exhibited a higher association between the TABP characteristics and the presence of CAD (Carmelli, Swan & Rosenman, 1985). A review of this study theorized that, in certain situations such as in a stressful marital situation or in an ego-involving challenge, the physiologic response of the TABP individual may be more intense. This challenge may be precipitated in interaction with a wife who is perceived as dominant (Smith & Sanders, 1986).

In 1981, the American Heart Association established a review panel to investigate the current evidence for the existence of coronary-prone behavior and coronary heart disease. They

cautioned against equating the term TABP with coronary-prone behavior as it had not yet been clearly established that it was not merely a specific aspect or component of TABP that was predictive of illness (Review panel on coronary-prone behavior and coronary heart disease, 1981). Indeed, a promising direction for continued TABP research at present seems to be concentration on the component of hostility as it relates to cardiovascular reactivity (for reviews see Dembroski & Costa, 1988; Linden, 1987; Williams, 1987).

The proposed link between TABP and CAD has a physiologic basis as TABP individuals have been found to respond differentially to stress in terms of increased catecholamine production (Dembroski & McDougall, 1983). This could lead to an increased rate of intimal damage in the blood vessels (Rosenman, 1983) and development of arteriosclerotic plaques over damaged areas. Another mechanism of action is hypothesized to be the indirect influence of catecholamines in increased mobilization of serum lipids and platelet aggregation (Manuch & Krantz, 1984), again resulting in plaque formation.

Other directions of research into personality as a risk factor have examined the trait of neuroticism. Eysenck (1987) defined coronary-prone behavior as a reaction to "stress and frustrative non-reward by chronic irritation and anger ... and (failure) to establish emotional relations." He also observed "coronary-prone" individuals as highly anxious (Eysenck, 1981) thus scoring high on

his measure of neuroticism. Studies measuring neuroticism using the Cornell Medical Index found that subjects' complaints of chest pain, shortness of breath, vertigo and palpitations correlated highly with elevated scores on neuroticism (Costa, Zonderman, Engel, Baile, Brimlow & Brinker, 1985; Engel, Baile, Costa, Brimlow & Brinker, 1985). The IHD symptoms did not, however, correlate with actual arterial damage seen on angiography leading the authors to suggest that many diagnoses of IHD are based on neurotic complaints from patients rather than on actual coronary artery ischemia. Neuroticism cannot be equated with TABP however. TABP and classic anxiety states produce different individual reactions to challenge. Emotionality cannot, therefore, be used as the sole indicator (Rosenman & Chesney, 1985).

A recent trend in the research of risk factors has been in the area of social support. In an examination of psychosocial factors present in heart disease, Cooper, Faragher, Bray and Ramsdale (1985) found that reports of MI, positive EKG evidence of MI and hypertensive history correlated with low social support scores. These three factors were also found to be most predictive of CAD in a regression analysis. Similarly, Ruberman, Weinblatt, Goldberg and Chaudhary (1984) found that social isolation (by definition, the lack of social support) independently and significantly contributed to risk of death in the period of three years post-MI. Seeman and Syme (1987) also found that both the

lack of emotional support and instrumental aid correlated highly with the incidence of CAD in both males and females separately. Syme (1987) speculates that the inverse relationship between CAD and social support may also encompass the Type A theory in that Type A individuals may not invest the requisite amount of time and energy in social relationships. After a review of the published and on-going research, an American Heart Association (AHA) task force added "lack of social support" to the list of traditional environmental risk factors of CAD (AHA, 1987).

MYOCARDIAL INFARCTION

MI is defined as deprivation of the blood supply to the heart (ischemia) for a period of time sufficient to produce structural damage of the heart muscle (Karliner & Gregoratis, 1983). For many individuals an MI may be the first indication of CAD. For others, the presence of heart disease may have been heralded by symptoms of transient ischemia (angina pectoris) occuring with exertion (Williams & Wallace, 1983).

The occurrence of an MI is diagnosed in a number of ways. A typical clinical history begins with chest pain not relieved by nitroglycerin. A resting electrocardiogram (EKG) provides evidence of disturbances in the conductivity of the heart muscle resulting from muscle damage. Analysis of characteristic changes in the levels of serum enzymes creatinine phosphokinase (CPK), lactate dehydrogenase (LDH) and serum glutamic oxaloacetic transaminase (SGOT) released as a result of muscle damage is performed. Finally, angiography, an invasive radiologic procedure that outlines the coronary arteries, will reveal areas of blockage or narrowing (Wenger, 1981a). Typically, abnormalities in the first two criteria are considered diagnostic while angiography determines the extent of damage.

Physical recovery

Physical activity

For the 75-80% of people who survive an acute MI (Karliner & Gregoratos, 1983), the process of recovery and rehabilitation may be long and hard. Until recently, it was thought that an MI patient must be immobilized for six to eight weeks to ensure adequate healing of the heart tissue (e.g., Cecil & Loeb, 1951; Lyon, 1965). Activities such as climbing stairs were discouraged for up to a year and return to a normal lifestyle was unusual (Wenger, 1981a). Contemporary medical treatment of MI patients, however, advocates early ambulation and a subsequent exercise program of some type in an effort to re-establish cardiac work capacity and prevent cardiovascular complications of prolonged bed rest (Wenger, 1981a). Aerobic exercise may, as well, encourage the development of collateral circulation in an effort to by-pass the damaged tissue although this has not been angiographically demonstrated (see Perkins, Oldenburg & Andrews, 1986).

Patients undergoing exercise programs report positive psychological benefits compared to non-exercise control groups, such as less anxiety and depression and more independence and sociability (Goff & Dimsdale, 1985; Goldwater & Collis, 1985; Mayou, 1983; Mayou, Sleight, MacMahon & Florencio, 1981; Stern, Gorman & Kaslow, 1983). It has not been demonstrated, however, that exercise actually affects the morbidity and mortality rates

related to future cardiac episodes. For example, although Rechnitzel, Pichard, Paivis, Yuhasz and Cunningham (1972) found a lower incidence of cardiac death in exercising subjects, they felt there were too many intervening variables, such as blood pressure and history of angina, to be able to attribute the difference solely to exercise. Kavanaugh, Shepherd, Chisholm, Qureski and Kennedy (1979) found differences between exercising and non-exercising subjects only when electrocardiographic abnormalities and serum cholesterol were taken into consideration. In an effort to remedy a major criticism of these studies, specifically that of small sample size, Shepherd (1983) pooled the data from three separate studies of exercise in post-MI patients and concluded that subjects who exercised had a 25-35% mortality advantage over control subjects who were not enrolled in an exercise program. This conclusion can be challenged however, as there were major inconsistencies between studies regarding reason for death and content of exercise programs. Other studies have found no significant difference between the cardiac death rates for exercising and non-exercising patients (Bengtsson, 1983; Stern, Gorman & Kaslow, 1983). In addition, many organized exercise programs include lifestyle counselling and information sessions making the ability to discern the benefits of exercise alone very difficult.

Pharmacotherapy

Pharmacologic therapy post-MI is usually reserved for patients who continue to experience symptoms of transient ischemia (angina) that are not relieved by rest alone. Medication used could be one of a series of beta-adrenergic blockers that reduce the sympathetic nervous system load on the heart (Arsenberg, 1981); one of a series of calcium-channel blockers that reduce vascular resistance, myocardial contractility and electrical conductivity (Bennett, 1981); or long or short-acting nitrates (e.g., nitroglycerin) which cause a vasodilatory effect in coronary arteries (Wagner & Robinson, 1981). Medication can also be employed in an effort to control the various risk factors contributing to MI -- hypertension, hypercholesterolemia and an elevated hematocrit.

Physiologic measures of recovery

Metabolic equivalency (MET) level

A MET is used to describe resting oxygen intake and is an overall measure of cardiovascular endurance and physical work capacity (Naughton & Haider, 1973). It is usually measured by the individual's performance on a graded treadmill or a bicycle ergometer. One MET is equivalent to the metabolic cost to the body at rest (Blumenthal & McCubbin, 1987). Post-MI, an individual should have a performance capacity of five to eight METS, and with good recovery and regular exercise, should increase to upwards of nine to ten METS within one year (Naughton, 1973).

Heart rate

Heart rate is a function of the state of physical fitness and the degree of physiological impairment (Naughton & Haider, 1973). As the patient's fitness levels increase, both the resting heart rate and the heart rate at maximum workload should decrease (Naughton, 1973). The most pronounced indicator of a training effect in MI patients is the submaximal heart rate (Thompson, 1988) and is measured at the 75% point of the patient's workload.

Blood pressure

Blood pressure is a function of cardiac output and vascular resistance. With exercise training, it has been reported that resting systolic pressure can be significantly reduced (Bruce, 1983).

EKG

Depression of the ST segment of the wave complex, with or without the report of chest pain, may be an indicator of myocardial ischemia (Bruce, 1973). An ST depression of approximately 1 mm is considered a significant indicator of ischemia. As myocardial tissue healing proceeds, ST depression during exercise is less likely to occur.

Psychological recovery

Psychological sequelae to an MI

Psychological recovery from the experience of an MI begins when the patient is still in intensive care. Individual responses are varied but the most frequently seen initial reaction is acute anxiety related to the life-threatening situation (Hackett & Cassem, 1973; Johnston, 1985). This anxiety, which may last from three to five days, is often followed by depression which may approximate grief (Hackett & Cassem, 1973). The anxiety, managed by realistic reassurance from the staff and mild anti-anxiety agents, usually causes no long-term problems. The depression, however, may become protracted and present treatment difficulties requiring psychiatric intervention (Hackett & Cassem, 1973; Tessar & Hackett, 1985).

Patients who seem to be experiencing little or no anxiety may be in the process of denying that anything life-threatening has occurred (Bar-On, 1985; Hackett & Cassem, 1973). Denial as a coping mechanism may be beneficial in the short-term as it has been shown that deniers may return to normal functioning more quickly; but denial may result in long-term problems. Specifically, information processing and behavior change can be impeded (Bar-On, 1985; Shaw, Cohen, Doyle & Palesky, 1985). Denial has also been found to be a precursor to non-compliance with subsequent treatment regimens (Tessar & Hackett, 1985).

For many patients, the difficult transition may not be the hospitalization but the return home. Patients at this time report intense ambivalence regarding the eagerness to, but fear of, resuming a normal life (Johnson, 1976). There are concerns about if and how to handle the resumption of employment. Feelings about the meaning of life and self-worth are explored. Family roles may change resulting in necessary alterations in self-concept. Finally, the threat of recurrence of an MI and with it, the threat of sudden death is always present (Croog & Levine, 1976).

The degree to which a patient takes on the "sick-role" after discharge from hospital, as well as the degree to which that role is encouraged and fostered by family and friends may predict recovery patterns. Wicklund, Sanne, Vedin and Wilhelmsson (1984a; 1984b) found that, although 70% of all patients restricted their daily activities two months post-MI, those who maintained that behavior after one year were more preoccupied with their health and reported more chest pain. Those patients also tended to be supported in their "invalidism" by wives and families who protected the patient from physical exertion and assisted them with daily activities.

The patient's premorbid personality and styles of coping, rather than the event of the MI, have been found to be the best indicators of whether or not the patient will have psychological difficulties during recovery. Mayou (1984), in a study of 229

male MI survivors, found that psychological and social outcome (e.g., rates of depression, return to work, etc.) was best predicted by premorbid psychosocial functioning in addition to the patient's mental state while in hospital. He also found that it could be determined early after discharge whether or not the patient would have any psychological difficulties. Wicklund et al (1984a) found that attitudes towards recovery at two months post-MI were good predictors of physical and psychological recovery at one year. Such evidence has led a number of authors to suggest that psychotherapy for post-MI patients should be restricted to those who demonstrate problems with coping early in the course of recovery (Fisher, 1973; Johnston, 1985; Razin, 1982). Blumenthal (1985) has outlined a psychological assessment that he recommends be routinely performed on MI patients prior to discharge in order to identify those that may need intervention. It includes evaluation of personality functioning and psychopathology, neuropsychological functioning, patients' perception of physical health and social support systems.

Psychosocial rehabilitation

Programs designed to provide rehabilitative guidance either through counselling or through education for MI patients have been evaluated for their relative benefits. The aims of such programs have been to improve the quality of life for the patient by assisting in recovery to as close to premorbid functioning as possible and, hopefully, to postpone, if not prevent, a recurrent MI.

Psychotherapy - group counselling

In examining the benefits of psychotherapy alone, Adsett and Bruhn (1968) found that short-term group psychotherapy did not result in any differences on physiologic measures of blood pressure and heart rate or on psychological/psychiatric measures of anxiety and depression when compared with patients receiving routine cardiac care. Ibrahim, Feldman, Sultz, Staiman, Young and Dean (1974) also compared patients in psychotherapy groups with patients having no psychotherapeutic intervention. They found subsequent significant changes only in the measure of social alienation, with the control subjects experiencing more alienation. There were no significant differences between groups in psychological well-being as measured by the Jackson Personality Form, nor in the proportion of smokers. Psychotherapy was of little value in improving survival prognosis except in the more severely ill patients who demonstrated a better, albeit statistically insignificant, one-year survival rate.

In comparing the benefits of group counselling versus exercise therapy, Stern, Gorman and Kaslow (1983) found that subjects in both treatment conditions experienced less depression and were more sociable relative to a control group. Neither counselling nor exercise produced any differential effects on mortality after one year, although the exercise group reported fewer cardiovascular sequelae.

Of note is the replicated finding (e.g., Adsett and Bruhn, 1968; Blanchard & Miller, 1977; Blumenthal, 1985; Ibrahim et al, 1974) that the "group process" experienced in the post-MI psychotherapy group is different from that typically found in groups of psychiatric patients. Ibrahim et al (1974) found that the MI patients were reluctant to discuss feelings and attitudes and concluded that the patients "worked to convey the idea that although they might be physically damaged, in every other way they were 'perfectly normal'" (Ibrahim et al, 1974, p. 356). In a review of the literature, Blanchard and Miller (1977) recommended that, for this reason, group therapy in post-MI patients be educative and support-based rather than psychotherapeutically oriented.

Psychotherapy - individual counselling

Counselling on an individual basis when patients have concerns has been shown to be therapeutic. Frasure-Smith & Prince (1985) found that patients who had stress counselling available had better general health (as measured by the General Health

Questionnaire) at one year post-MI than a control group who had no counselling available. There were also fewer CAD-related deaths in the treatment group over the one year period.

Education

An educational program was compared to a counselling/education program by Oldenburg, Perkins and Andrews (1985). The education group received information about heart disease and its treatment in addition to relaxation training procedures. The counselling group received six to eight sessions of individual counselling and training in behavioral strategies in addition to the educational sessions. Both groups performed significantly better on measures of psychological functioning than groups with no intervention. There was, however, no difference between experimental groups. Comparing an education/counselling ("advice") group to an exercise group, Mayou, Sleight, MacMahon and Florencio (1981) found that, although the exercise group was more enthusiastic about their treatment, the advice group had better outcome in terms of overall satisfaction, hours spent at work and satisfaction with sexual activity than exercise subjects or control subjects. Finally, a combination exercise/information group was compared to a group receiving routine cardiac follow-up with the findings that the experimental group had significantly better cardiovascular functioning (heart rate, blood pressure, treadmill results) and had a better knowledge of cardiovascular disease and associated treatment after four months than the control group (Ravario,

Hohlmes & Holmsten, 1984). Thus, it seems that some intervention is better than no intervention at all, but the literature examining whether education, counselling, exercise or combinations of the three are more efficacious in terms of recovery is still equivocal. Whether or not this intervention need necessarily be organized or institutionalized is also debateable, as it has been shown that patients participating in an institutionalized (systematic) rehabilitation program did no better on measures of resumption of employment and exercise habits than patients undergoing a program of home rehabilitation (Erdman, Duivenvoorden, Verhage, Kazemier & Hugenholtz, 1986). However, the rate of smoking cessation in the systematic rehabilitation group was higher, perhaps indicating a need for group support in some aspects of rehabilitation such as lifestyle change.

Lifestyle modification

Lifestyle and behavioral changes are another potential source of major psychological distress for the recovering patient. According to Hackett and Cassem (1973), the deprivation that a patient must suddenly undergo when told to quit smoking, stop overeating and relax is overwhelming and any attempt to modify any or all of these behaviors is almost certainly doomed to fail. Newton, Sivarajan and Clarke (1985) found that patients who were of the attitude to change their behaviors when interviewed in hospital were generally successful in the areas of smoking

cessation, weight loss and resumption of sexual activity but were less successful in establishing a healthful diet, exercising and reducing job and family stress. Conversely, Miller, Wickoff, McMahon and Garrett (1984) found that intentions in hospital did not correlate with behavior on follow-up.

Successful behavior change has been found to be positively related to family and spousal support, a feeling of personal control and a perception of susceptibility to recurrent MI (Gianetti, Reynold & Rihn, 1985; Mermelstein, Cohen, Lichtenstein, Baer & Kamarck, 1986; Miller, Wikoff, McMahon & Garrett, 1984). Successful lifestyle change may also be a function of the patient's environment and education. Conroy, Mulcahy, Graham, Reid and Cahill (1986) found that those most successful in smoking cessation after in-hospital advice were younger, white-collar and more highly educated.

Self-efficacy

The feeling that one has some semblance of control over aspects in one's life is a component of the concept of self-efficacy (Bandura, 1982). Bandura defined perceived self-efficacy as being "...concerned with the judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982, p. 122). He believed that post-MI patients lack the self-efficacy in their physical capabilities to resume their customary activities, but that this self-efficacy could be enhanced (O'Leary, 1985). To test this, Ewart, Taylor, Reese and DeBusk (1983) examined patients'

confidence in their physical abilities (measured by self-efficacy scales) before and after performing on a symptom-limited treadmill test. Patients with negative tests (i.e., those whose reasons for stopping were not related to myocardial ischemia) demonstrated an increase in confidence after the test for activities similar to treadmill walking, while further counselling regarding the treadmill results helped the patients to generalize that confidence to dissimilar activities. Patients whose tests were limited by symptoms of angina (i.e., a reminder of CAD), had lower self-efficacy scores after the test. In another study using the same self-efficacy scales, Taylor, Bandura, Ewart, Miller and deBusk (1985) found that perceptions of self-efficacy proved to be significant predictors of subsequent treadmill performances with the more confident patients performing better in terms of peak workload and heart rate.

Bandura contends that MI recovery is a social matter and that the spouse's notions about the patient's efficacy can aid or retard the recovery process. This was investigated by Taylor et al (1985). In this research, one group of wives observed their husbands on the treadmill, another group walked on the treadmill and a third group did not participate in the treadmill phase. The wives had also completed efficacy ratings on their husbands' abilities before and after the test. The findings indicated that the wives who walked on the treadmill themselves increased their

ratings of their husbands' abilities to a level equivalent to that of their husbands' ratings, while the other two groups demonstrated no such increase.

In conclusion, recovery from an MI can be a psychologically trying time, but most individuals without a premorbid history of psychological/psychiatric problems do not usually require psychotherapeutic intervention. Rehabilitative assistance of some kind however, whether in the form of exercise, counselling or education, can be beneficial to long-term recovery perhaps as a result of the support or sense of control it may give the patient. Clearly, psychological and physical recovery are inextricably related with physical intervention resulting in psychological benefits and vice versa. It is not clear, however, whether rehabilitation can prevent future cardiac episodes.

Impact of MI on wives

The attitudes and actions of the wives of post-MI patients may indeed impact on and influence the patient's recovery (Radley & Green, 1986). Before she can be supportive, however, there are many emotions with which she must deal as well (Nyamathi, 1987; Orzeck & Staniloff, 1987; Skelton & Dominian, 1973). She has been faced with the threatened loss of a spouse which may leave her with the desire to support her husband but also the need to be supported herself (Nyamathi, 1987).

Typically, when the patient is still in hospital, the wife focuses on emotion-controlling coping (Nyamathi, 1987). She, too, may experience a grief-related episode which can cause appetite and sleep disturbances and, in some cases, psychosomatic symptoms (Hentinen, 1983; Skelton & Dominian, 1973). Although reports of generalized anxiety peak while the patient is in hospital, most wives continue to report mild to moderate anxiety up to three months after discharge (Dhooper, 1983).

After the patient returns home, the wife may assume responsibility for the care of the patient, occasionally to the point of usurping responsibilities that can and should be performed by the patient (Nyamathi, 1987). For example, the patient may be protected from family arguments and decision-making. The wife may insist the patient follow diet instructions and take medication, even to the point where the patient may begin

to see his wife as dominant and controlling (Adsett & Bruhn, 1968; Croog & Levine, 1977; Skelton & Dominion, 1973).

A possible explanation for the overprotectiveness may be the fear of allowing the patient to participate in something that may cause a recurrence of the MI. Impacting upon this is the feelings of guilt frequently expressed by wives that they may have, in some way, been responsible for the MI and that it is now their responsibility to prevent a recurrence (Adsett & Bruhn, 1968; Skelton & Dominian, 1973). Although overprotectiveness intuitively seems non-beneficial to the patient, empirical data is not currently available to either support or refute the contention. One could theorize that the TABP patient would become increasingly hostile due to feelings of loss of control and continue to respond cardiovascularly in the manner that aided in the development of CAD in the first place, but this remains to be demonstrated.

Long-term healthy psychological adjustment for the couple may be related to the patient's adjustment to the illness. Skelton and Dominian (1973) found higher rates of depression in wives whose husbands were more seriously ill. Radley and Green (1986) found that patients who had difficulty dealing with the illness, regardless of symptom severity, and who had become quite passive, experienced a great deal of strain in the marriage.

Generally, though, the initial urge to overprotect is transient and, as the patient recovers, the family returns to normal functioning with few long term changes necessary (Croog & Levine, 1977). The event may, in fact, increase marital statisfaction as recovery proceeds. Michela (1987) found that as a result of reevaluation of the meaning of the relationship in the face of possible loss, a healthy marriage can become even more statisfying. A high sense of personal control, supportive family functioning and close attachments have also been demonstrated to contribute to a high level of interpersonal functioning in married subjects post-MI (Ell & Haywood, 1985).

SOCIAL SUPPORT

The patient recovering from an MI has many resources available to him to aid in a return to normal life. These include individual or personal resources, larger social structures such as family and friendship networks and, finally, formal organizational networks such as hospitals, rehabilitation clinics and medical support (Croog, 1983). The patient's informal network of social support can significantly influence recovery from MI. Quantity and quality of support can facilitate and enhance recovery or it may serve as a barrier (Croog, 1983; Davidson, 1987).

Social support--theory

Social support is a broad concept encompassing many aspects of the individual's interaction with the social environment. Generally, it is defined as the information that one receives from those around that leads the individual to believe that he/she is loved and cared for, esteemed and valued, and belongs to a network of communication and mutual obligation (Cobb, 1976).

Wortman and Dunkel-Schetter (1987), in their review of the various theories of social support, conclude that there are basically four types of support: expression of positive affect (love, caring, esteem), agreement with and acknowledgement of beliefs and feelings, open expression of beliefs and feelings and, finally, the information that the person is part of a network.

The network of social connections is fundamental to the concept of social support. Barrera (1986) referred to this as "social embeddedness" and felt that the quantity of social contact was an important aspect of the support system. Sarason, Levine, Basham and Sarason (1983) felt that the actual number of significant others in the social network was an element inherent within the idea that there were people who could be available for an individual if needed.

The perception of the availability of support was most important to Sarason et al (1983). Barrera (1986) defined perceived support as the "cognitive appraisal of being reliably connected to others...or the adequacy of social ties" (Barrera, 1986, p.416). Heller, Swindle and Dusenbury (1986) felt that it was this appraisal aspect of the supportive activity that impacted on the individual psychologically.

The actual assistance given was an important aspect of Thoits' (1985, 1986) definition of social support. She reconceptualized social support as "coping assistance" and emphasized the actual aid given and received, regardless of whether that aid was emotional, instrumental or informational (Thoits, 1986). She also felt the effect of this type of support was to provide the individual with a sense of identity and belonging. An off-shoot of this sense of belonging was an enhancement of self-esteem. Heller et al (1986) considered the esteem-enhancing function more important for health maintenance than the more practical component.

A dynamic view of social support was presented by Heller and Swindle (1983) who defined social support as an interactive process between the individual and the environment. They felt that the support an individual receives is a function of the availability of support structures and the skills the individual has with which to access and maintain supportive relationships.

It has been observed that not all types of support were equally effective in reducing distress (Wortman & Dunkel-Schetter, 1987). For example, in a study where university students were asked to evaluate various types of support in times of distress, they felt emotional support would be most beneficial (Barling, McEwan & Pratt, 1988). Noteworthy in this study, however, was the fact that the subjects were not distressed at the time of the study. In studies of disabled individuals, Kutner (1987) found the support needed depended on the type of disability but that received support was seen as most beneficial whether it was emotional, tangible or informational. McNett (1987) and Wethington and Kessler (1986), on the other hand, found that the mere perception of support being available was effective in diffusing stress.

The theoretical framework of social support employed in this thesis will consider the impact of the social network upon the patient's perception of having support available. Firstly, the supportive network of family and friends must be present and available to the individual. This network must then be willing

and able to provide aid, emotional as well as tangible. Finally, the recipient of the support must recognize the aid and interpret it or appraise it as helpful or not helpful as reflected in the recipient's feelings of self-esteem.

Family as a source of support

Support, although available from a wide variety of sources, is typically most influential on health when derived from the spouse, immediate family and intimate friends (Croog, 1983; Heller, Swindle and Dusenbury, 1986). As a social unit, the family can provide the patient with emotional support, approval, tension release and guidance in addition to practical assistance. Procidano and Heller (1984) showed that support from family members had a stronger negative correlation with distress and psychopathology than support from friends. Support from family members was also less dependent upon the social skills and competence of the individual. However, not all family ties are necessarily supportive. Minimal support can have negative psychological and psychosomatic consequences (Croog, 1983; Dhooper, 1984; Fiore, Becker & Coppel, 1983). The premorbid family and marital situation will also have a significant influence on the support networks within the family in the recovery phase (Croog & Levine, 1977). A confrontational, argumentative family will not suddenly become warm and supportive just because the husband/father has had a heart attack. Further,

financial problems resulting from the temporary or sometimes, permanent unemployment of MI patient may cause family strain.

It has been shown that the support that the family receives while the MI patient is in hospital and in the early stages of recovery has an indirect but measurable effect on the patient's recovery. Findlayson (1976) examined patient outcomes at one-year related to the support the wife received during the crisis period. Patients whose wives were well supported, both emotionally and practically, had the best physical recovery at one year. Interestingly, the best outcome was found when the husband (i.e., the patient) was also supportive of the wife. It was unclear, however, whether this was a function of the quality of the marital relationship or severity of the husband's illness. Finally, Ell and Haywood (1984) found that social support measures were more significant in predicting cardiac outcomes at six and twelve months post-MI than such factors as illness severity or premorbid life events. They additionally found though, that the best predictor of outcome was a personal sense of control.

In evaluating helpful social networks, grown children have been perceived to be the most helpful, with the wife's immediate kin (especially mother and sister) equally helpful when available (Dhooper, 1984; Findlayson, 1976). Informal networks are seen to be the major sources of support whereas social agencies, whose mandate is to provide supportive assistance, have been found to be poorly utilized by MI patients and their families (Croog & Levine, 1977; Dhooper, 1983, 1984).

Social support and health

As presented earlier, the lack of social support has been proposed as a psychosocial risk factor in the development of CAD. Research has also demonstrated a positive relationship between the presence of a social support network and health in general. In a longitudinal study of over 6,000 participants, Berkman and Syme (1979) found a consistent pattern of higher mortality rates with each decrease in social connections, even when presence of illness, health practices and use of health services were controlled. They found that people who lacked social and community ties were more likely to die in the nine year follow-up period than were those with more extensive contacts.

Cassels (1976) states that the psychosocial process, the way an individual interacts with and reacts to the environment, influences susceptibility to disease. Broadhead et al (1983), in a review of the literature, concluded that social support can serve not only as an effect modifier or buffer but also as a direct determinant of health and illness. Thus, two models of the effect social support has on health have been formulated: the stress-buffering model and the main-effect model (Cohen, 1988).

The "buffering hypothesis" (Cohen & McKay, 1984), is based on Lazarus's theory of perceived stress. It theorizes that social activities and support functions may intervene between the stressful event and possible outcomes by attenuating a threat appraisal or by providing a reappraisal of the threat thereby

protecting the individual from the pathogenic effects of the stressful event. Relating this to the example of an individual with CAD, a reappraisal of a stressful situation may result in a decrease in catacholamine production (or, conversely, prevent an increase) thus counteracting a mechanism hypothesized as operative in CAD development. This model implies that support is beneficial only to individuals in stressful situations. Empirical validation of the buffering hypothesis has been inconclusive (Cohen & McKay, 1984; Lazarus & Folkman, 1984).

Thoits (1986) and Sarason et al (1983) have suggested that the stress-buffering function of social support may only be part of a larger mechanism and may interact with self-concept or locus of control in the final outcome of health promotion or illness prevention. Thus, the main-effect model is based on the overall concept of social integration. This model incorporates the concepts of role identity (sense of mastery), self-esteem and social influences into the notion of taking care of one's self because the individual feels s/he is worthy to her/himself as well as to others (Cohen, 1988).

An off-shoot of this model is the contention that family and spouse will directly and indirectly influence the patient's adherence to treatment regimens or lifestyle changes. Mermelstein, Cohen, Lichtenstein and Kamarck (1986) found that smoking cessation was positively correlated with support provided by wives, but that long-term maintenance of the behavior change

was better predicted by the number of smokers in the environment. Hilbert (1985), studying post-MI patients and their wives, found no relationship between spouse support and regimen compliance.

Cohen (1988) cautions that social integration could operate in a detrimental manner. For example, with an anxious, overprotective wife as discussed earlier, the patient may feel a loss of control over his health (Nyamathi, 1987). The patient may feel he is not only prevented from doing things for himself, but is physically unable to do them, thus creating a "vicious circle" of lowered self-esteem. On the other hand, the patient may attempt to reassert himself in an attempt to gain control. Support for this was provided in a study evaluating the effects of education on treatment compliance. Dracup, Meleis, Clark, Clayburn, Shields and Staley (1984) found that although patients who participated in the educational sessions were more compliant in areas of diet and blood pressure control than patients who did not participate, the patients who attended the sessions without their wives actually became more compliant than those whose wives accompanied them. Thus, the encouragement from the spouse to comply could promote or be detrimental to health or recovery depending upon the patient's perception and appraisal of the support received.

In conclusion, social support does influence health and recovery from illness, although the mechanism of how this is accomplished is presently speculative. The support most important to a patient recovering from an MI comes from his family and other close social connections, although the way that support is perceived by the patient may influence the way it is received and the way in which it impacts on the individual's self-esteem.

Self-esteem

A major function of positive social support is the enhancement in self-esteem arising from the feedback of others regarding one's abilities and worth (Thoits, 1986). Sarason et al (1983) demonstrated a positive relationship between measures of self-esteem and social support. Those subjects high in social support also reported a feeling of control over positive events in life.

An individual recovering from an MI may receive feedback from himself and from others regarding his lack of abilities that might erode his self-esteem and impede the motivation to recover. Many studies have discussed unquantified spousal support in assisting with MI recovery (e.g., Croog & Levin, 1977; Heinzelman, 1973; Miller, Wikoff, McMahon, Garrett & Ringel, 1985) but whether or not this support is perceived as esteem-enhancing is unclear. The Taylor et al (1985) study demonstrated that the treadmill test can be used as a vehicle to alter the wife's perception of her husband's abilities by allowing her to experience similar levels of physical exertion. It can be theorized that when the wife has a concrete appreciation of her husband's physical capabilities, she may be more likely to communicate that appreciation to him with a positive reflection on his self-esteem. This has yet to be demonstrated empirically.

Hypotheses

This study was designed to examine the relationships between the patients' own self-efficacy, his feelings of self-esteem, his wife's level of confidence in his abilities and the influence of these psychosocial variables on physiologic indicators of MI recovery. It was hypothesized that strong feelings of self-efficacy could enhance self-esteem. Confidence in husbands' physical capabilities expressed by wives could also result in feelings of positive self-esteem. These feelings of self-esteem and self-confidence were then hypothesized to translate into improved physical performance on a treadmill. It was also hypothesized that wives' exposure to treadmill testing would give them an appreciation of their husbands' abilities which could translate into positive feelings of self-esteem and self-efficacy for the husbands.

Specifically, this thesis examined the relationship between the psychological variables of social support and self-efficacy and treadmill performance indicators of physical recovery post-MI. In addition, the question as to whether the patient's perception of social support could be influenced by wives' participation in treadmill testing and/or the Reh-Fit program was assessed.

The hypotheses were as follows:

1. Subjects with higher scores on measures of self-efficacy (SE) would achieve a higher metabolic equivalency (MET) levels, a lower heart rate (HR) and less ST-segment (ST) depression at peak workload than those with lower self-efficacy scores.
2. Subjects scoring higher on the total measure of social support would achieve higher METs, lower HR and less ST depression at peak workload than those with lower scores on the scale.
3. Subjects with a higher level of self-esteem (as measured by a subscale of the social support measure) would demonstrate higher self-efficacy scores.
4. Subjects whose wives gave higher estimates of their husbands' abilities (ES) would have higher SE scores and achieve higher MET levels at peak workload.
5. Subjects whose wives performed a treadmill test would demonstrate a greater increase from baseline to follow-up on measures of self-efficacy and of esteem-enhancing social support (as measured by the self-esteem subscale).

METHODS

Subjects

The subjects were 39 male individuals who had experienced a recent MI or had undergone previous coronary artery bypass grafting (CABG) with subsequent MI and who met criteria for participation in the Manitoba Cardiac Institute (Reh-Fit) program. All but one subject had experienced just one MI. They had been referred to the Centre by their physician and did not have severe angina, severe ventricular dysfunction or exercise related arrhythmias (Mymin, 1982). Coronary heart disease had been documented by either clinical history, electrocardiogram (EKG) and enzyme evidence of MI or angiographic findings (Rovario, Holmes & Holmsten, 1984). Subjects were recruited in person by the investigator at an early introductory class at the Reh-Fit Centre. Subjects ranged in age from 38 to 78 years of age with the mean age being 55.3 years. Elapsed time between the MI and enrollment in the program ranged from six weeks to 12 months with the average time being 16.8 weeks.

Data was also available from an additional seven subjects who did not fit the study criteria -- three men and two women who had undergone CABG subsequent to an MI and two women who had experienced a first MI. These data will be presented for illustrative purposes only.

Procedure

Patients entering the Reh-Fit program for post-MI patients were approached at an early introductory Reh-Fit class regarding participation in the study. They were told that the purpose of the study was to examine the effects of psychological factors on MI recovery. At this time, they were asked to complete two questionnaires -- the self-efficacy scale and the Interpersonal Support Evaluation List (ISEL) -- and were asked to sign a consent form allowing the investigator access to the results of their treadmill tests at the Reh-Fit Centre (See Appendix A). They were also told that they would be asked to repeat the questionnaires in four months and that, at that time, the investigator would need access to the results of their four-month follow-up treadmill test.

Wives of all patients willing to participate were contacted by the investigator, first by letter (see Appendix B) and then by telephone. Wives who had plans to join the "Pre-Fit" program offered by the Reh-fit Centre were told that they would be sent a questionnaire asking them to rate their perception of their husbands' abilities. These questionnaires were to be returned to the investigator in a self-addressed stamped envelope or dropped-off at the Reh-Fit Centre. Since the goal of the Pre-Fit Program is to reduce overall cardiovascular risk in the community as a whole (Mymin, 1982), participants undergo an initial health screening and have the same treadmill test as the Reh-Fit participants.

Wives who had no plans to join the Centre were asked about their willingness to answer the wives'/partners' questionnaire. If they agreed, they were then asked if they would be willing to participate in the treadmill testing set up by the investigator. If they refused the treadmill testing, they were only sent the questionnaire that was to be returned in the self-addressed stamped envelope. If they agreed to participate in the treadmill testing phase, they were sent a questionnaire and were also randomly selected to receive or not receive the treadmill test. All wives participating in the study were also told that they would be sent the same questionnaire again in four months.

Consent regarding wives' participation in treadmill testing was obtained prior to the procedure (see Appendix C). A cover letter to wives, accompanying the questionnaires, explained the nature of the study and assured confidentiality. Return of the questionnaire constituted consent (see Appendix B).

A number of subjects told the investigator at time of initial recruitment that they did not want their wives involved in the study. Additionally, a small number of subjects were separated, divorced or widowed and were not involved in an intimate relationship.

Thus, once Reh-Fit participants had agreed to participate, the participation of their wives further divided them into the following groups.

1. Those whose wives had joined the Reh-Fit Centre.
2. Those whose wives received a treamill test administered by the investigator and her colleagues.
3. Those whose wives were willing to have a treadmill test but were not selected to have it.
4. Those whose wives answered the questionnaire but were unwilling to have the treadmill test.
5. Those whose wives were unwilling to participate in any way or those who did not have a wife.

Data from the spousal questionnaire is available for the first four groups.

Subject participation broke down into groups in the following manner. Four men had wives who had joined the Reh-Fit Centre and participated in group activities with their husbands. Ten women volunteered to participate in treadmill testing. Of these, five women underwent treadmill testing and five didn't. Although group assignment was made randomly, in practice, two women who had been selected to receive treadmill tests were unable to meet scheduled appointments and thus were assigned to the opposite group by default. All of these women also completed an efficacy questionnaire. Nine women agreed to complete a questionnaire but were not willing to have the treadmill test. Reasons given for

refusal included lack of time, health problems and lack of interest. Finally, sixteen men participated without involvement of a spouse. Of these, six men were divorced or widowed, one had a wife with Alzheimer's Disease, four didn't want their wives involved and five questionnaires were returned unanswered. Of the "extra" subjects, questionnaires were available from all but one of the spouses (a female MI patient).

Follow-up questionnaires were mailed to participants a week before they were scheduled for their four month re-evaluation visit with instructions to return the completed questionnaires in an enclosed stamped envelope. If questionnaires were not returned within fourteen days a prompt was sent. Despite numerous prompts, follow-up questionnaires were not obtained from five subjects although the results of the follow-up treadmill tests were available. One subject dropped out of the Reh-Fit program before the four month follow-up as a result of worsening of his condition, another subject did not have a four-month re-evaluation due to seasonal migration and a third was lost to the program for unknown reasons. Thus, for these three subjects, no follow-up data is available.

Treadmill testing

Exercise testing was performed on a motorized treadmill at the Reh-Fit Centre for the patients and at the Health Sciences Centre for the wives. Reh-Fit testing was done by Reh-Fit staff as per standard protocol. The test consisted of a modified Balke protocol employing a constant speed of 5.4 kilometers per hour with increasing slope of 2% per minute (See Appendix D). For the patients, the test continued until the appearance of limiting symptoms: chest pain, dyspnea, fatigue, leg cramping or dizziness. In the absence of symptoms, the protocol called for the exercise to be stopped in the case of hypotension (a drop of 10 mmHg from peak value during exercise) or the appearance of three consecutive premature ventricular complexes (PVCs) (Bruce, 1973; Taylor et al, 1985). Electric defibrillation was immediately available in both locations in case of emergency, and cardiac intensive care was quickly available within the hospital. The investigator was not involved in the testing at the Reh-Fit Centre but had access to all records from the testing. Testing of participating wives at the Health Sciences Centre was done by the investigator (a registered nurse), a certified cardiologist and a certified exercise technologist from the Reh-Fit Centre.

The wives walked on the treadmill until the appearance of limiting symptoms. The debriefing after the test included a comparison of the levels achieved by the participant and her husband and an explanation of the husband's abilities post-MI.

Counselling regarding a suitable exercise regimen of walking was also given if the subject expressed a desire to go for walks with her husband.

All subjects, while on the treadmill and for a suitable period afterwards (up to ten minutes), were monitored by a twelve-lead EKG for wave changes, PVCs and heart rate. A continuous, computerized visual three-lead (V_1, V_5, AVF) rhythm strip was displayed in order to monitor for arrhythmias and ischemia and a complete twelve-lead strip was printed at one minute intervals. Heart rate was continuously monitored via the video display terminal. Blood pressure was checked manually at one minute intervals up to five minutes into recovery and then at three minute intervals until vital signs returned to normal.

Materials

Physiologic Measures of Treadmill Performance

MET level

A MET, the overall indicator of cardiovascular endurance and physical work capacity, is a function of treadmill speed and slope elevation. Metabolic equivalents calculated for the modified Balke protocol used in this study can be found in Appendix D.

Heart rate

Heart rate (HR) was measured electronically via the chest leads of the EKG on a continual basis. Heart rates of interest to the study were taken with the subject supine and at rest prior to the exercise test (HRR), at peak workload on the treadmill (i.e.,

the point at which the subject asked to stop the test) (HRP) and at 75% of maximum work capacity (examined retrospectively at the 75% point of total time spent on the treadmill) (HRS). This was easily obtained from computer print-outs of the test.

Blood pressure

Blood pressure (BP) was measured manually at the brachial artery using a standard mercury sphygmomanometer. To facilitate readings while the subject was walking, the diaphragm of the stethoscope was kept in place with a latex band around the subject's arm. Readings were taken every minute while the subject was on the treadmill and until BP stabilized after testing. Readings of interest to the study were taken while the subject was at rest and supine prior to the test (BPR) and at peak workload during the test (BPP).

ST segment depression

EKG monitoring of electrophysiologic changes in the heart was done as previously described in the treadmill testing. ST segment depression (ST), the measure of myocardial ischemia, was typically monitored using the V_5 chest lead and was measured at its maximum displacement during exercise. Measurement was done electronically on computer printouts and was validated by visual measurement of wave displacement.

Psychological Measures

Interpersonal Support Evaluation List (ISEL)

The ISEL (Cohen, Mermelstein, Kamarck & Hoberman, 1985)measures the perceived availability of four separate functions of social support -- tangible support (instrumental aid), appraisal support (the availability of someone to talk to), self-esteem support (the availability of a positive comparison when comparing oneself to others) and belonging support (having people to do things with). This scale was chosen after examination of the Social Support Questionnaire - SSQ - (Sarason et al, 1983), the Perceived Social Support Scales - PSS - (Procidano & Heller, 1985), and the Social Support Scale - SSS - (Finch, Marshall & Gelhart, 1986) for two reasons. The first is that the ISEL measures the appraisal aspect of the support the individual receives. Second, it measures two relevant concepts related to self-efficacy, esteem enhancement and perceived social support.

The general population version of the ISEL is comprised of 40 statements about the perceived availability of social resources (see Appendix E). The positive and negative statements are counterbalanced and the scale is scored by counting the number of responses in accordance with the key. The higher the score in each subscale and in the measure as a whole, the higher the perception of support.

Internal reliability of the scale ranges from .88 to .90 while ranges for the subscales are .70-.82 for appraisal, .62-.73 for self-esteem, .73-.78 for belonging and .73-.81 for tangible support (Cohen et al, 1985). The test-retest reliability over both two days and a four week period was .87 (Cohen et al, 1985).

Self-efficacy scale

The measure of self-efficacy devised for post-MI patients (Bandura, 1982; Taylor et al, 1985) consists of 12 scales, each of which describe different levels of abilities to perform common activities that may stress the heart (see Appendix F). For each activity, the participant rates, on a 100 point scale, how likely s/he feels s/he is to perform that activity -- from very uncertain (0) to completely certain (100). The scales include five measures of physical ability (walking, running, climbing stairs, lifting weights and engaging in sexual activity), four measures of ability to withstand emotional stressors (anger arousal, bodily tension, social stress and family discord), and a rating of overall cardiac capability. The scales are scored by averaging the summed confidence levels of each task. Self-efficacy estimates have not been found to change with repeated testing in the absence of interventions (Ewart et al, 1983; Taylor et al, 1985).

Statistical analyses

Statistical methods utilized in this study were primarily descriptive in nature and were employed to examine correlations between variables and combinations of variables. To evaluate appropriateness of tests, univariate analyses of variables for normality and homogeneity of variance were performed. It was found that the variables corresponding to the ISEL and its subscales as well as ST depression had non-normal distributions but could be rank ordered. This was reasonable as the ISEL subscales had scores ranging from 1 to 10 with most subjects responding at the upper end while ST depression scores ranged from 0.0 to 3.0 with the majority of subjects scoring at 0.0. Thus, these variables met the requirements for use of nonparametric statistics (Conover, 1971).

Relationships between variables were examined using Pearson's products moment correlation (r) where both variables were normally distributed. Where either one or both variables were non-normally distributed, Spearman's rho (rho) was used. To validate the presence of a truly linear relationship between significantly correlated variables, bivariate scatterplots were examined.

Tests of partial correlation were performed on combinations of variables that had a theoretical relationship using statistics obtained from analysis of variance (ANOVA). Similarly, stepwise multiple regression was employed to examine the existence of predictive variables or combinations of variables.

Finally, differences between groups were examined using one way fixed analysis of variance for normally distributed variables and a Kruskal-Wallis test of Wilcoxon rankings for non-normal variables.

All tests of significance were set at an alpha level of 0.05. Computer data analysis was done using SAS, Version 5 (SAS Institute, 1985).

RESULTS

Baseline

Data obtained from the 39 male MI patients and their spouses upon entry into the study were considered baseline. At the time of data collection, wives volunteering to participate in treadmill testing had not yet been randomized into "treadmill" or "no treadmill" groups and thus were treated as one group. Means and standard deviations of the variables metabolic equivalency (METs), subjects' self-efficacy ratings (SE), spouses' estimates of subjects' efficacy ratings (ES), the Interpersonal Support Evaluation List (ISEL) and its subscales Appraisal (A), Belonging (B), Tangible (T), and Self-esteem (S) as well as heart rate (HR) and ST depression at peak workload can be found in Table 1. There were no significant differences between groups on any of these measures.

Overall, clinical status, treadmill performance and psychological test scores revealed a sample group with relatively uncomplicated recovery. The mean workload achieved on the treadmill test was 8.7 + 2.4 METs with an average peak heart rate of 134.8 + 22.7 beats per minute (bpm), scores within or slightly above the range expected (Bruce, 1973; Ewart et al, 1985). Most of the subjects discontinued the test because of fatigue or shortness of breath while only three stopped because of chest pain. The average self-efficacy rating at baseline was

Table 1

Descriptive statistics for variables at baseline:

Group means and standard deviations

Level of spousal participation	Wives at Reh-Fit	Volunteering Wives	Questionnaires only	No spousal participation
	n=4	n=10	n=9	n=16
Measure				
Age	57.25 (11.4)	51.7 (9.9)	53.2 (10.6)	58.1 (12.6)
METs	8.4 (1.4)	9.6 (2.7)	9.6 (2.2)	8.5 (2.3)
SE	52.2 (11.9)	60.0 (14.7)	63.2 (14.4)	62.3 (16.8)
ES	48.7 (6.9)	60.7 (14.8)	56.9 (13.9)	-
ISEL	30.3 (9.0)	31.6 (4.7)	31.1 (7.7)	34.3 (5.0)
(A)	7.5 (3.3)	6.1 (2.2)	6.8 (2.0)	7.3 (2.2)
(B)	8.0 (3.4)	8.3 (1.5)	8.5 (2.9)	9.1 (1.7)

(continued)

(T)	8.3 (2.4)	9.7 (0.7)	9.0 (1.7)	9.5 (1.2)
(S)	6.5 (2.1)	8.4 (1.0)	6.7 (2.0)	8.4 (1.4)
HR	131.8 (14.8)	132.5 (21.4)	146.4 (26.77)	128.9 (24.4)
ST	.38 (.75)	.38 (.62)	.33 (.70)	.71 (.89)

Note: Standard deviations are listed in parentheses.
All F statistics for ANOVA and Chi-square statistics for Kruskal-Wallis were non-significant.

See text for abbreviations

60.8 + 14.8 while the mean of spousal estimates of efficacy was 57.2 + 12.9 out of 100. Perceptions of social support fell within population norms (Cohen et al, 1985) achieving a mean of 32.8 + 6.1 out of 40 on the total score.

Self-efficacy

It was hypothesized that those subjects scoring higher on the measure of self-efficacy would achieve a higher MET level, a lower heart rate and less ST-segment depression at peak workload on a treadmill exercise test. A significant correlation was found on the baseline measure between degree of self-efficacy and MET level achieved ($r=.7064$, $p=.0001$). When METs and self-efficacy were compared on a bivariate scatterplot, a significant outlier with a low self-efficacy score of 27 and a low METs of 4.7 was discovered. Reanalyses with the outlier deleted showed a weaker, albeit still significant correlation ($r=.5656$, $p=.0002$).

Contrary to expectations, a positive correlation was found between peak HR and self-efficacy scores ($r=.6892$, $p=.0001$). The relationship between ST depression and self-efficacy was not found to be significant ($r=.1266$, $p=.44$).

In order to examine any interrelationship between METs, HR and ST in their influence on SE, the three variables were analyzed simultaneously using a test of partial correlation (Neter & Wasserman, 1974). It was investigated whether the correlation between SE and METs ($r=.7064$) would change significantly when HR and ST were added into the equation. It was found that, although

the correlation between METs and SE remained significant ($t(35)=4.45$, $p<.05$), the correlation coefficient with HR and ST entered into the equation did not change appreciably ($r=.7064$ to $r=.6007$). Thus it can be concluded that the correlation between SE and METs was not influenced by the values of HR and ST.

Stepwise multiple regression was also performed to determine the relative predictive values of METs, HR and ST on SE. METs alone was found to be predictive of SE ($F(1,38)=26.4614$, $p<0.0001$). No other variables were entered into the prediction equation at the 0.150 significance level.

Analysis of the data was also performed on the entire group of subjects including CABG patients and women (n=46). The correlation between SE and METs with this sample was weaker, albeit still significant ($r=.5219$, $p=.0006$) as was the correlation with HR ($r=.3480$, $p=.018$). The correlation with ST remained non-significant ($r=-.0998$, $p=.698$). Stepwise regression analysis again revealed METs to be the only significant predictor of SE ($F(1,45)=18.8685$, $p<.0001$).

Social support

The hypothesis that the total social support score (ISEL) would be positively related to METs and inversely related to peak heart rate (HR) and ST depression was not supported (see Table 2).

The total social support score was, however, found to be significantly correlated with self-efficacy ($rho=.4467$, $p=.005$).

Further, the subscale of the ISEL that measures tangible support (T) was also found to be related to self-efficacy, (rho=.4025, p=.0122) as was the "Belonging" (B) subscale (rho=.3717, p=.0216). The correlation between self-efficacy and the self-esteem subscale (S) approached, but did not reach significance (rho=.2896, p=.08) (see Table 3).

Table 2

Relationship of ISEL to criterion variables

For the study sample:

Variable	rho	p-value
ISEL x METs	.1454	.3837
ISEL x HR	.0126	.9400
ISEL x ST	-.0710	.6719

For the entire sample:

Variable	rho	p-value
ISEL x METs	-.0188	.9024
ISEL x HR	-.0262	.8642
ISEL x ST	-.0278	.8561

Note: All p-values non-significant

See text for abbreviations

Table 3

Relationship of Self-efficacy (SE) to criterion variables

For the study sample:

Variable	rho	p-value
SE x ISEL	.4467	.005**
SE x ISEL-A	.2274	.1697
SE x ISEL-B	.3717	.0216*
SE x ISEL-S	.2896	.08
SE x ISEL-T	.4025	.0122*

For the entire sample:

Variable	rho	p-value
SE x ISEL	.3952	.0072**
SE x ISEL-A	.2374	.1163
SE x ISEL-B	.3290	.0273*
SE x ISEL-S	.2622	.0818
SE x ISEL-T	.3594	.0153*

* significant at $p<.05$
** significant at $p<.01$

See text for abbreviations

Spousal influence

Support was found for the hypothesis that higher estimates of wives' confidence in their husbands' abilities (ES) would result in higher self-efficacy scores and higher MET levels. Analysis also showed a predictive relationship between ES and METs that overshadowed the relationship between METs and SE. Since estimates of efficacy were available from only 21 spouses, only those subjects whose spouse answered a questionnaire were used in the analysis.

Spouses' estimates of the patients' abilities (ES) were found to be significantly correlated with subjects' self-efficacy scores ($r=.7891$, $p=.0001$) (see Table 4). Bivariate scatterplot confirmed a linear relationship. Paired t-tests, performed to compare couples' estimates, showed no differences between husbands' and wives' estimations of abilities in the groups where the wives had volunteered to take the treadmill test. However, estimates from the wives who answered the questionnaire but did not volunteer for the treadmill test were significantly lower than their husbands' self-efficacy estimates (paired $t(15)=2.81$, $p<.02$).

Spousal estimates were also found to be positively correlated with METs achieved ($r=.6890$, $p=.0006$). In order to determine which variables could be predictive of METs at baseline, multiple regression analysis using standardized variables was performed on the model: METS = SE ES ISEL. The overall F test was significant ($F(3,17)=7.12$, $p<.005$) with contributions of the variables

(derived from beta weights) as follows: ES = 49.8%, SE = 20.1% and ISEL = 22.2% (see Table 5). A sequential F test was then performed on the model: METS = ES ISEL because SE and ES were so highly correlated. ISEL was found to contribute to the model negligibly. Thus, ES alone was found to account for 68% of the variance in METs when examined by itself. However, due to the multicollinearity of SE and ES, this holds true only for this model and cannot be generalized to other models or other data sets (Younger, 1985).

Analysis of partial correlations between METs and SE, while adding ES and ISEL, showed the maintenance of a significant correlation ($r=.25$, $p<.05$) between METs and SE, but because the value of the correlation coefficient decreased substantially, ISEL and ES can be presumed to be contributing to the relationship between METs and SE.

Finally, as can be seen in Table 4, the correlations between ES and the criterion variables in the entire sample were similar to the study sample with the exception of the correlation with ISEL-S ($rho=.4053$, $p<.05$). This provides some support for the hypothesis that spousal estimates may be influential on self-esteem although perhaps not in the study population *per se*.

Table 4

Relationship of spousal estimates (ES) to criterion variables

For the study sample:

Variable	r(rho)	p-value
ES x SE	.7891	.0001***
ES x METs	.6890	.0006**
ES x ISEL-S	.2463	.2817

For the entire sample:

Variable	r(rho)	p-value
ES x SE	.7749	.0001***
ES x METs	.5874	.0016**
ES x ISEL-S	.4053	.0495*

* significant at $p<.05$
** significant at $p<.005$
*** significant at $p<.0001$

Table 5

Summary information from the Stepwise Regression analysis for predictors of METs

Model: METS = ES SE ISEL

Variable	B value	p-value
SE	.2005	.5003
ES	.4977	.081
ISEL	.2215	.235

Note: Model R-squared = .5569

Overall p=.0026

Model: METs = ES

Variable	B value	p-value
ES	.6829	.0006

Note: Model R-squared =.4747

Four-month follow-up

The data obtained at the four-month follow-up can be seen in Table 6. No significant differences between groups were found on any of the variables although differences on ISEL-S approached significance ($X^2(4)=9.45$, $p=.0507$). The mean score for the group whose wives had joined Reh-Fit was the lowest at 5.8 while the group whose wives had experienced the treadmill had the highest mean score (9.60). Significant changes from baseline to follow-up (as determined by t-tests) were found in METs ($t(30)=2.95$, $p=.004$) and SE ($t(25)=2.25$, $p=.03$) while the difference in ES from baseline to follow-up approached significance ($t(13)=2.01$, $p=.056$). All changes were in a positive direction (i.e., increases).

Self-efficacy

The correlations obtained between self-efficacy and the hypothesized criterion variables can be found in Table 7. Again, partial support was found for the hypothesis that SE would be positively correlated with METs and negatively correlated with HR and ST depression. In the study sample, SE was strongly correlated with METs ($r=.7136$, $p=.0001$) while a positive correlation between SE and HR approached significance ($r=.3981$, $p=.0294$). Again, SE and ST were not significantly correlated ($rho=.2747$, $p=.1418$).

Partial correlations, holding the relationship between METs and SE constant while adding HR and ST into the equation, showed a non-significant change in the correlation coefficient (from r=.7064 to r=.6300) again indicating a non-significant interaction between the variables. Mulitiple regression analysis, as well, entered METs into the equation as a predictor of SE ($F(3,26)=29.06$, $p=.0001$) but added neither HR nor ST.

Table 6

Descriptive statistics for variables at follow-up:

Group means and standard deviations

Measure	Wives at Reh-Fit n=4	Volunteering Wives Treadmill n=5	Wives No treadmill n=4	Questionnaire only n=9	No spousal participation n=14
METs	9.8 (0.6)	11.9 (0.7)	11.1 (2.7)	10.8 (2.4)	10.4 (2.6)
SE	63.7 (13.3)	71.9 (6.7)	69.7 (10.5)	68.8 (13.5)	71.9 (16.6)
ES	61.5 (13.3)	69.3 (9.6)	71.4 (2.1)	64.4 (17.0)	-
ISEL	26.5 (14.2)	7.8 (1.1)	33.3 (1.5)	32.7 (7.2)	32.9 (6.9)
(A)	5.3 (4.1)	8.8 (0.5)	6.0 (1.7)	7.4 (2.2)	6.8 (2.4)
(B)	6.7 (4.7)	9.8 (0.5)	9.3 (0.6)	8.8 (1.9)	8.5 (1.6)
(T)	8.8 (2.5)	9.8 (0.4)	9.7 (0.6)	9.6 (0.5)	9.1 (2.1)
(S)	5.8 (3.6)	9.6 (0.5)	8.3 (0.5)	6.8 (2.9)	8.5 (1.7)
HR	139.3 (18.0)	149.8 (8.9	147.0 (17.2)	149.7 (17.3)	138.1 (23.9)
ST	0.0 (0.0)	.38 (.8)	0.0 (0.0)	.28 (.57)	.82 (1.2)

Note: All p-values were non-significant

See text for abbreviations

Table 7

Relationship of Self-efficacy (SE) to the criterion variables

For the study sample:

Variable	r	p-value
SE x METs	.7136	.0001***
SE x HR	.3981	.0294*
SE x ST	.2747	.1418

For the entire sample:

Variable	r	p-value
SE x METs	.6161	.0001***
SE x HR	.3002	.0845
SE x ST	.1712	.3329

* significant at $p<.05$
** significant at $p<.01$
*** significant at $p<.0001$

Social support

Contrary to the findings at baseline where no support was found for the hypothesis that social support scores would correlate positively with METs and negatively with HR and ST depression, partial support was found at follow-up. ISEL was found to correlate moderately with METs (rho=.4878, p=.0073). This was further supported by stepwise regression analysis where ISEL was entered as a predictor of METs (F(1,14)=7.16, p=.0181). Again, however, ISEL did not correlate significantly with either HR or ST (see Table 8) nor were the variables entered into the regression equation.

In addition to the total scale score correlating positively with METs, scores on two subscales were found to be correlated with METs, specifically ISEL-A (rho=.4725,p=.0096) and ISEL-B (rho=.5083, p=.0049).

As at baseline, ISEL again correlated positively with SE (rho=.5429, p=.002), as did ISEL-B (rho=.6026, p=.0004) and ISEL-S (rho=.5082, p=.004). Similar results were also found in the entire sample (see Table 9).

Table 8

Relationship of social support (ISEL) to criterion variables

For the study sample:

Variable	rho	p-value
ISEL x MET	.4878	.0073**
ISEL x HR	.1763	.3603
ISEL x ST	.1705	.3767

For the entire sample:

Variable	rho	p-value
ISEL x MET	.2840	.1093
ISEL x HR	.0682	.7060
ISEL x ST	.2439	.1713

* significant at $p<.05$

** significant at $p<.01$

Table 9

Relationship of Self-efficacy (SE) to Social Support (ISEL) and its Subscales

For the study sample:

Variable	rho	p-value
SE x ISEL	.5429	.002**
SE x ISEL-A	.4528	.0120*
SE x ISEL-B	.6026	.0004***
SE x ISEL-S	.5082	.0042**
SE x ISEL-T	.2478	.1867

For the entire sample:

Variable	rho	p-value
SE x ISEL	.4936	.0030**
SE x ISEL-A	.4271	.0118*
SE x ISEL-B	.5866	.003**
SE x ISEL-S	.4795	.004**
SE x ISEL-T	.2936	.0919

* significant at .05
** significant at .01
*** significant at .001

Spousal influence

Although spousal estimates of efficacy were strongly correlated with both performance (METs) and the subjects' self-efficacy estimates at baseline, only the correlation between wives' estimates (ES) and husbands' self-efficacy was significant at follow-up (see Table 10).

Partial correlations performed at follow-up examined the relationship between SE and METs when ES was added to the equation. A much weaker correlation coefficient (from r=.7064 to r=.3365) was created. This indicates that, although ES and METs were not themselves significantly correlated, ES may still be accounting for a substantial component of the correlation between METs and SE. Thus, although ES may not be directly correlated with METs, its influence on SE is still important.

Standardized multiple regression analysis (see Table 11) showed that the overall F test for the model: METs = ES SE ISEL was not significant ($F(3,12)=2.07$, $p=.1576$). Total variance accounted for by the model was .34. Beta values in the overall model allotted 44% of the predictive value to SE, 3% to ISEL and a negative prediction of -4.4% to ES. Thus, in contrast to the results at baseline, the best predictor of METs at follow-up was SE alone.

Table 10

Relationship of spousal estimates (ES) to criterion variables

For the study sample:

Variable	r/rho	p-value
ES x METs	.3777	.1492
ES x SE	.7065	.0015**
ES x ISEL-S	.5277	.03*

For the entire sample:

Variable	r/rho	p-value
ES x METs	.2838	.2390
ES x SE	.6161	.0001**
ES x ISEL-S	.4795	.004**

* significant at $p<.05$
** significant at $p<.01$

Table 11

Summary information from the Stepwise Regression analysis for predictors of METs at follow-up

Model: METs = ES SE ISEL

Variable	B value	p-value
SE	.44	.1837
ES	-.044	.8384
ISEL	.03	.8879

Note: Model R-squared = .3411

Overall p = n.s.

While spousal estimates were significantly correlated with ISEL-S only in the entire population at baseline, a significant correlation was found between ES and ISEL-S in the study population at follow-up as well (rho=.5277,p=.03). A partial correlation was performed on a model to predict METs that included SE, ES and ISEL-S. There was an insignificant change in the correlation between METs and SE when ES and ISEL-S were added to the model (from .5082 to .518) thus supporting a strong relationship between METs and SE which is minimally influenced by ES and ISEL-S.

Differences over time

The hypothesis that subjects whose wives received a treadmill test would demonstrate a greater increase from baseline to follow-up on measures of self-efficacy and esteem-enhancing social support was difficult to test because of the small and unequal group sizes. Nonparametric statistics were employed to test for group differences since they would be most robust to the violations of unequal and small cell sizes. Results of Kruskal-Wallis tests can be seen in Table 12. Differences appoached significance in the total score on the ISEL scale only.The change was largest in the group whose wives experienced the treadmill (+5.20) while the group whose wives had joined Reh-Fit experienced a decrease in mean score on the ISEL (-3.75). Although this provides preliminary support for the hypothesis

that, in experiencing the treadmill, the wives could influence their husbands' feelings of perceived support, a larger sample would be required to confirm the finding. No differences were found between groups on any other variables.

Regression showed that self-efficacy at baseline was predictive of self-efficacy at follow-up ($F(1,23)=19.17$, $p=.0002$) and that METs at baseline was predictive of METs at follow-up ($F(2,22)=25.36$, $p<.0001$), replicating findings of Ewart et al (1985). In a multiple regression analysis of predictors of METs at follow-up, only METs at baseline was found to be predictive. Although the overall model which included METs, SE and SES at baseline was significant ($F(3,9)=13.76$, $p<.001$), parameter estimates showed that only METs was contributing to the model. A stepwise regression of this model confirmed this.

Finally, in examining changes over time, a comparison was made using multiple regression, between a "full" model containing SE, ES, ISEL as predictors of METs and partial models containing either SE or ES with ISEL (see Table 13). At baseline (Time=1), the full model was a significant predictor of METs while models with SE or ES alone were also strong predictors of METs. At follow-up (Time=2), the full model was no longer significant. The model with SE was a significant predictor of METs while the model with ES was not. This provides further evidence for the lack of a direct relationship between ES and METs at follow-up.

Table 12

Non-parametric analysis of changes between groups over time

Variable	Chi-square	degress of freedom	p-value
METs	3.06	4	.5485
SE	2.41	4	.6079
ES	1.42	3	.7003
ISEL	9.42	4	.0515
ISEL-S	3.01	4	.5565

None of the values were significant at .05

Table 13

Comparison of changes in influences on METs over time

	Full Model[1]	SE[2]	ES[3]
Time 1	F(3,17)=7.12 p=.0026*	F(2,35)=11.48 p=.0001***	F(2,18)=1.55 p=.0008**
Time 2	F(3,12)=2.78 p=.113	F(2,26)=13.76 p=.0001**	F(2,13)=1.96 p=.1799

1 METs = SE ES ISEL

2 METs = SE ISEL

3 METs = ES ISEL

* p<.05
** p<.001

DISCUSSION

The premise that how one feels about oneself in times of illness can influence recovery from or adaptation to that illness is basic to the study of Behavioural Medicine. Bandura's (1982) notion of self-efficacy in cardiac patients provides a theoretical basis for explaining how regaining a sense of control over events affected by the illness can enhance recovery. Along similar lines, it has been theorized that the support one receives from significant others can influence those feelings of control and thus ultimately influence the recovery process (Bandura, 1982; Ell & Haywood, 1984, Thoits, 1986). The results of this study demonstrated that, although spouses' impressions of abilities were influential early in recovery, personal feelings of self-efficacy were most important at subsequent stages of recovery.

Self-efficacy

The finding that self-efficacy was strongly correlated with treadmill performance (METs) at baseline and at follow-up replicated studies by Ewart et al (1985) and Taylor et al (1985). Further replication of findings by Ewart et al (1985) involved the demonstration that METs and SE at follow-up could be predicted from the scores on METs and SE at baseline. Ewart et al (1985) further demonstrated that perceptions of self-efficacy could be improved by successful treadmill performance. Because the present study only measured self-efficacy after a treadmill experience, it is difficult to tell if the ratings were based on the subjects'

actual treadmill experience or on their impressions of their abilities. However, if one conceptualizes self-efficacy and positive experiences as interacting to augment one another (i.e., a positive experience enhances self-efficacy which serves to provide more positive experiences that further enhance self-efficacy), the correlation and not the directionality is what is important. The failure to find an interactive relationship between METs and SE at baseline that would predict METs at follow-up however, may suggest a more complex scenario.

Self-efficacy scores also correlated positively with heart rate at peak of treadmill performance at baseline, a relationship which replicated findings by Taylor et al (1985) but was opposite to that hypothesized. The rationale for the hypothesis was that higher self-efficacy may translate into improved recovery at an early stage and would manifest in lower heart rates (i.e., more efficient heart rates) (Bruce, 1973). However, the subjects with higher self-efficacy achieved higher MET levels which, by definition, increased the workload on the heart. Thus, HR was a function of the workload and did not reflect myocardial efficiency in and of itself. A better way to compare efficiency of the heart would have been to measure heart rate on all subjects at a predetermined point (time or workload) regardless of the total time spent walking on the treadmill. A confounding factor in this subject population however, would be medication. Many of these subjects were receiving beta-blocking and calcium-channel blocking

drugs which decrease resting heart rate and cause changes in normal heart rate reactivity to physical and emotional stress. This would have made measures of heart rate unreliable.

Finally, ST depression was not found to correlate with self-efficacy scores in any direction. Because the range of ST depression was so small (0.0 to 3.0), it was statistically difficult to detect any differences. Additionally, the incidence of clinically significant ST-segment depression in this sample was very small (16 out of 39 at baseline and 8 out of 37 at follow-up), making systematic changes even more difficult to detect. A possible reason for the low rate of ST depression could have been that many subjects, especially those who achieved lower MET levels, stopped the test for reasons other than symptoms of myocardial ischemia (angina).

The finding that self-efficacy and treadmill performance correlated strongly at both baseline and follow-up measurements adds convergent validity to the use of the self-efficacy scale in assessment of post-MI patients. It is reasonable to speculate that measurement of self-efficacy could be a valuable tool in evaluating a patient's progress post-MI. Identification of individuals whose scores fall outside the norm may assist in targetting those who may require intervention. For example, any "outliers" whose scores may be very low in comparison with others may require intervention to prevent from becoming invalided as a result of a perception of disability (see Garrity, 1975,

regarding "cardiac invalidism"). Conversely, an individual who has very strong feelings of self-efficacy may be denying his morbidity and may be at risk for non-compliance with treatment (see Bar-On, 1987). Additionally, comparing the subjective measure of self-efficacy with an objective measure such as treadmill performance could also identify individuals whose perception of ability/disability is incongruent with his actual level of ability/disability.

Social support

Although the degree of support one receives from one's social network may play a role in the etiology of heart disease (e.g., AHA, 1987; Seeman & Syme, 1987), there is no empirical evidence to indicate its direct role in post-MI recovery. Indeed, Ell and Haywood (1984) found that a supportive family did not predict functional or cardiac status post-MI. The second hypothesis stated that the total measure of social support would be positively correlated with METs and inversely correlated with peak heart rate and ST depression. No support was found for this hypothesis at baseline, although at follow-up, ISEL and two of its subscales, ISEL-A and ISEL-B, were found to correlate positively with METs. Further, ISEL correlated positively with SE both at baseline and at follow-up while subscales ISEL-T and ISEL-B correlated with SE at baseline and ISEL-A, ISEL-B and ISEL-S correlated with SE at follow-up. Correlation between ISEL-S and SE at baseline approached significance.

The finding that support correlates with SE can be examined using Thoits' conceptualization of esteem-enhancing social support (Thoits, 1985, 1986). Thoits theorized that social assistance and a sense of belonging had a role to play in developing a sense of environmental mastery and self-esteem (cf. self-efficacy). In this study, a sense of belonging (ISEL-B) correlated with SE at both baseline and follow-up. ISEL-T (instrumental aid) was more important to SE at baseline, perhaps due to an individual's need for more tangible assistance immediately post-MI. It could be speculated that, as independence increases over the four-months, the need for tangible assistance decreases and self-esteem reasserts itself. This was supported by the absence of a significant correlation between SE and ISEL-T at follow-up and by the appearance of a significant correlation between SE and ISEL-S (the self-esteem subscale).

The absence of a correlation between METs and ISEL-S in addition to the finding that ISEL-S does not influence the correlation between METs and SE may indicate that self-efficacy and self-esteem, at least as measured by the tools used in this study, may be two different concepts. Indeed, the self-efficacy measure examines confidence in ability to perform a set of tangible behaviours while the self-esteem subscale examines how one compares oneself with others on a more cognitive dimension.

Thus, although they may develop in a parallel fashion, they may not have the same influence on physical recovery and should be examined seperately.

The appearance of correlation between ISEL and METs at follow-up is difficult to explain. Since ISEL measures support from the entire social network available to the individual, it may be speculated that the development of a network of peers (i.e., other MI patients undergoing rehabilitation) may contribute to a sense of belonging (measured by the ISEL-B) and having people around who understand how one feels (measured by the ISEL-A). Further, the sense of competition "on the track" inherent within this network can contribute to improvement in workload capacity resulting in a direct training effect.

The only baseline measure that was predictive of treadmill performance at follow-up was METs. Although METs is a physical measure, it cannot be assumed that those who would achieve higher MET levels had less severe heart disease. Many diverse factors will influence when an individual chooses to terminate the treadmill test such as shortness of breath or leg cramps, fear of angina or of reinfarction, even a sense of competitiveness (AHA, 1972). Indeed, in this study population, evidence of myocardial ischemia (either with angina or >1mm ST depression) was the reason for test termination for a very small minority of subjects. Thus, with the many factors that influence MET levels, they alone may not be a sufficiently pure or sensitive measure upon which to base prediction of recovery.

Spousal influence

Adjustment to a chronic illness is not an individual experience (Radley & Green, 1986). Although each of the marriage partners experiences their own emotional reaction to an MI (Adsett & Bruhn, 1968; Skelton & Dominian, 1973), the quality of the marital relationship and the interactive support within that relationship can impact upon the psychological as well as the physical recovery process (Bandura, 1982; Michela, 1987).

The study found that spouses' estimates of efficacy (ES) at baseline were positively correlated with METs and with subjects' reports of self-efficacy. ES and ISEL were also found to be more predictive of METs at baseline than SE. The relationship was further shown to be independent from the correlation between SE and METs which was a strong relationship in and of itself. One may speculate, based on Thoits (1985, 1986) that the subjects, at this point, may be more influenced by a reflected sense of confidence that comes from their spouses and support network than by an inwardly generated self-confidence. This translated into a correlation between ES and ISEL-S for the entire sample, but not for the study sample. It remains to be seen if a larger sample would have resulted in a significant correlation for the study population.

At follow-up, however, ISEL-S was significantly correlated with ES although neither correlated with METs. The finding that SE alone was the most powerful predictor of METs further supports the contention that, at follow-up, inwardly generated self-confidence is the most important psychosocial variable in physical treadmill performance.

One can only speculate on the reasons why wives volunteering to participate in treadmill testing made more accurate estimates of their husbands' efficacy. It may be a reflection of the degree of involvement with the husband and awareness of his capabilities at that point in time. As Taylor et al (1985) demonstrated, wives who actually performed a treadmill test increased their ratings of their husbands' efficacy to approximate the husbands' ratings. Although wives who merely watched their husbands on the treadmill did not change their ratings, this may have been more a reaction to their husbands' apparent distress during the test than a function of their involvement. This also indicates however, that watching husbands on the treadmill is not an appropriate vicarious substitute for wives walking on the treadmill.

The failure to find a correlation between spouses' estimates and METs at follow-up was interesting. Perhaps, since a sense of control has been shown to be important in psychological well-being post-MI (Ell & Haywood, 1984), as the subject gains more independence through participation in the rehabilitation program and becomes more aware of his own capabilities, the reliance upon others for a sense of confidence and self-esteem is diminished.

As mentioned previously, the subject may also have developed a peer network with whom he could compare himself and develop his own sense of self-esteem.

An alternative explanation may be that the wives vicariously experienced rehabilitation through the husbands' anecdotal reports of, for example, distance walked and, at four months, overestimated the husbands' abilities. Examination of the data however, shows that wives' estimates at follow-up were slightly lower than the husbands' self-efficacy ratings and thus the wives were not overestimating their husbands' abilities.

Finally the hypothesis that wives' participation in treadmill testing would influence the sense of social support was partially supported. The subjects whose wives had experienced the treadmill had the highest mean scores on the self-esteem subscale at follow-up while the same group showed the greatest change from baseline on the total social support score. Although this group was very small and a larger number of subjects would be needed to confirm this finding, it suggests that wives' participation in treadmill testing may influence the patients' feelings of self-esteem and perceived support. Thus, the wives' new-found appreciation for their husbands' abilities may result in reflected self-esteem for the patient and be perceived by him as an averall feeling of quality support. If indeed an effect is present however, alternative methods of enhancing wives' appreciation need to be found, since exposure to treadmill testing for all wives is neither practical nor cost-effective.

The group showing a drop in perceived support was the one whose wives had also experienced a treadmill test and had also undertaken rehabilitative activities with their husbands. This may support Dracup et al's (1984) findings that spousal participation in a program may be detrimental to the patient's success in the program. A direction for further research related to this would be to examine factors that may have influenced the wives' participation in the program, such as the dynamics of the spousal relationship, a sense of overprotectiveness on the wives' part or perceived severity of the husband's cardiac disease and general condition.

The groups whose wives neither joined Reh-Fit nor had a treadmill test showed non-significant changes in ISEL and ISEL-S, further supporting the finding of an effect on these variables related to treadmill testing. A more detailed analysis of wives' reasons for refusal to participate may also uncover dynamics that may be operative in the wives' degree of interest and involvement in their husbands' recovery.

While the group whose wives had joined Reh-Fit and the group whose wives had a treadmill test differed significantly on ISEL and ISEL-S, both social support measures, wives' participation had an effect on neither self-efficacy nor on wives' estimates. Although those men whose wives had experienced some form of rehabilitation demonstrated a change in their perception of support, it seems that their feelings of self-efficacy were

independent of their wives' participation and were, perhaps, self-generated. The sample size however, may have been too small to detect an effect if the effect were relatively weak. A problem, besides small sample size, however, may have been that any other benefits derived from the treadmill test, such as an influence on self-efficacy, may have dissipated after four months. Another test of self-efficacy, closer in time to the wife's treadmill test, may have given a more accurate measure of any influence related to the treadmill test.

Limitations

The major limitation in this study was the small sample size. This made analysis of group x time effects unreliable. There were also a number of correlations which approached significance and may have achieved it with a larger sample.

This was a convenience sample taken from a largely middle-class, white, urban population of individuals who were motivated to participate regularly in a rehabilitative program. Additionally, participation in the study was voluntary and thus further self- selected. For these reasons, the results of this study cannot be assumed to be generalizable to MI patients in general.

Finally, physical variables such as severity of disease and use of cardiac medications were not controlled for. Whether or not self-efficacy and treadmill performance are also related to extent of cardiac damage will need to be examined.

CONCLUSION

In conclusion, an individual's sense of self-efficacy was shown to correlate strongly with workload capacity at both testing periods, while the confidence expressed by spouses was correlated only at baseline. It can be speculated that, while spousal confidence appears to be important early in recovery and may indeed help the patient to get "back on his feet", long-term recovery may be dependent upon the individual patient's confidence in himself.

Wives' participation in treadmill testing was shown to be positively related to feelings of self-esteem and perception of social support for the patients when the wives were not involved in the rehabilitative program *per se* and negativly related when wives had joined the program. Perhaps a combination of the wife's appreciation of the husband's abilities plus a degree of independence for the husband may have had an effect on the husband's perception of the availability of support and self-esteem.

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APPENDIX A

CONSENT FORM - Reh-Fit participants
Impact of Psychological Factors on Heart Attack Recovery

I have been invited to participate in a study of persons rehabilitating from a heart attack or from by-pass surgery. The purpose of this study is to assess the association between various psychological factors and the rate of recovery and if there are any effects resulting from information given to the wife.

I have been told that the study will involve completing two questionnaires now and again in four months' time. I further understand that my wife may be contacted regarding her participation in treadmill testing as part of the study. I understand that, should my wife agree to participate, she will have a "fifty/fifty" chance of being chosen to have a treadmill test.

I agree that the researcher, Diana Clarke, can have access to my medical records at the Reh-Fit Centre. The information which is obtained will be treated as privileged and confidential and will not be released to any person without my written consent. The information obtained, however, will be used for a statistical and scientific purpose with my right of privacy maintained.

I understand that my decision to participate is voluntary. If I chose to withdraw from the study for any reason, I know that it will not jeopardize my usual treatment and participation in the Reh-Fit program.

Signature_____

Date_____

Witness_____

APPENDIX B

TO: Wives/Partners of Reh-Fit participants

FROM: Diana Clarke, R.N. Master's student, University of Manitoba

RE: Participation in my thesis research project examining factors involved in recovery from a heart attack.

I am writing to you to invite you to participate in my thesis research project which is examining factors contributing to recovery from either a heart attack or from bypass surgery. I am asking you to volunteer to experience the treadmill test that your spouse/partner has experienced. You have probably experienced many different emotions since his illness and, if you haven't been involved in any rehabilitative activities, you may not be fully aware of the kinds of activities he is capable of during the various stages in his recovery. The treadmill test will be designed to help you gain greater insight into his present physical capabilities.

I would appreciate knowing if you would be agreeable to taking a treadmill test at the Health Sciences Centre on a Tuesday or Thursday late afternoon/early evening. Should you be willing to participate, you will have a 50% chance of being contacted for the test since I will be randomly selecting only half of the people who have agreed to participate. Testing will be done by a team at the Health Sciences Centre consisting of Dr. T.E. Cuddy, a cardiologist, myself, a registered nurse, and a certified exercise technologist. All safety precautions will be followed.

If you are willing to participate, please give me your name, a phone number and the best time to reach you. I will call you within the next week to notify you as to whether you will receive a treadmill test and to make arrangements.

Thank you for your consideration.

APPENDIX C

CONSENT FOR TREADMILL TEST

I have been invited to participate, along with my husband, in a study of persons rehabilitating from a heart attack or from by-pass surgery. This study is aimed at assessing the association between various psychological factors and the rate of recovery. The purpose for my taking the treadmill test is to allow me to experience some of the same rehabilitation activities as my husband and gain some understanding of his physical capabilities after his heart attack. I understand that he has already consented to participation and that I have been randomly chosen from a group of wives willing to participate.

I understand that the test which I will undergo will be performed on a treadmill with the amount of effort increasing gradually. This increase in effort will continue until symptoms such as fatigue, shortness of breath, or chest discomfort may appear, which would indicate me to stop.

During the performance of the test, a physician and trained observers will keep under surveillance my pulse, blood pressure and electrocardiogram.

I have been advised that there exists the possibility of certain changes occuring during the test. They include abnormal blood pressure, fainting, disorders of heart beat (too rapid or ineffective) and very rare instances of heart attack. Every effort will be made to minimize them by the preliminary examination and by observations during testing. If any abnormalities are found, either during the preliminary exam or during the treadmill test, my designated physician will be contacted by the study physician. Emergency equipment and trained personnel are available to deal with unusual situations which may arise.

I understand that the information obtained will be treated as privileged and confidential and will not be released or revealed to any person without my written consent. The information obtained, however, will be used for a statistical and scientific purpose with my right of privacy retained.

I have read the foregoing and I understand it and any questions which may have occured have been answered to my satisfaction. I understand that my decision to participate is voluntary. If I chose to withdraw from the study for any reason, I know that it will not jeopardize my or my husband's participation in the Reh-Fit program.

Signature_____

Date_____

Witness_____

APPENDIX D: MODIFIED BALKE TREADMILL PROTOCOL

(Manitoba Cardiac Institue, Reh-Fit Centre)

MINUTES	SPEED KM/H	ELEVATION %	METS
1	5.4	2	4.5
2	5.4	4	5.4
3	5.4	6	6.4
4	5.4	8	7.3
5	5.4	10	8.2
6	5.4	12	9.1
7	5.4	14	10.1
8	5.4	16	11.0
9	5.4	18	12.0
10	5.4	20	12.8
11	5.4	22	13.8
12	5.4	24	14.7
13	5.4	25	15.1

APPENDIX E

Interpersonal Support Evaluation List

This scale is made up of a list of statements each of which may or may not be true about you. For each statement we would like you to circle probably TRUE if the statement is true about you or probably FALSE if the statement is not true about you.

You may find that many of the statements are neither clearly true nor clearly false. In these cases, try to decide quickly whether probably TRUE or probably FALSE is most descriptive of you. Although some questions will be difficult to answer, it is important that you pick one alternative or the other. Remember to circle only one of the alternatives for each statement.

Please read each item quickly but carefully before responding. Remember that this is not a test and there are no right or wrong answers.

Appraisal

1. There is at least one person I know whose advice I really trust. True False

2. There is really no one I can trust to give me good financial advice. True False

3. There is really no one who can give me objective feedback about how I'm handling my problems. True False

4. When I need suggestions for how to deal with a personal problem I know there is someone I can turn to. True False

5. There is someone who I feel comfortable going to for advice about sexual problems. True False

6. There is someone I can turn to for advice about handling hassles over household responsibilities. True False

7. I feel that there is no one with whom I can share my most private worries and fears. True False

8. If a family crisis arose few of my friends would be able to give me good advice about handling it. True False

9. There are very few people I trust to help solve my problems. True False

10. There is someone I could turn to for advice about changing my job or finding a new one. True False

Belonging

11. If I decide on a Friday afternoon that I would like to go to a movie that evening, I could find someone to go with me. True False

12. No one I know would throw a birthday party for me. True False

13. There are several different people with whom I enjoy spending time. True False

14. I don't often get invited to do things with others. True False

15. If I wanted to have lunch with someone, I could easily find someone to join me. True False

16. Most people I know don't enjoy the same things that I do. True False

17. When I feel lonely, there are several people I could call and talk to. True False

18. I regularly meet or talk with members of my family or friends. True False

19. I feel that I'm on the fringe in my circle of friends. True False

20. If I wanted to go out of town (eg., to the beach) for the day I would have a hard time finding someone to go with me. True False

Tangible

21. If for some reason I were put in jail, there is someone I could call who would bail me out. True False

22. If I had to go out of town for a few weeks, someone I know would look after my home (the plants, pets, etc.). True False

23. If I were sick and needed someone to drive me to the doctor, I would have trouble finding someone. True False

24. There is no one I could call on if I needed to borrow a car for a few hours. True False

25. If I needed a quick emergency loan of $100, there is someone I could get it from. True False

26. If I needed help in moving to a new home, I would have a hard time finding someone to help me. True False

27. If I were sick, there would be almost no one I could find to help me with my daily chores. True False

28. If I got stranded 10 miles out of town, there is someone I could call to come get me. True False

29. If I had to mail an important letter at the post office by 5:00 and couldn't make it, there is someone who could do it for me. True false

30. If I needed a ride to the airport very early in the morning, I would have a hard time finding anyone to take me. True False

Self-Esteem

31. In general, people don't have much confidence in me. True False

32. I have someone who takes pride in my accomplishments. True False

33. Most of my friends are more successful at making changes in their lives than I am. True False

34. Most people I know think highly of me. True False

35. Most of my friends are more interesting than I am.
True False

36. I am more satisfied with my life than most people are with theirs. True False

37. I have a hard time keeping pace with with friends.
True False

38. I think that my friends feel that I'm not very good at helping them solve problems. True False

39. I am closer to my friends than most other people.
True False

40. I am able to do things as well as most other people.
True False

APPENDIX F

Name:_____

The attached form describes various activities and tasks. Under the column marked "Can Do", check the tasks or activities you expect you could do now.

For the tasks you check under "Can Do", indicate in the column marked "Confidence" how confident you are that you could do the task. Rate your degree of confidence using a number from 10 to 100 on the scale below:

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

Remember, rate what you expect you could do and your confidence you could do it now. Even if some of the activities or situations do not seem to apply to you, try to imagine them and answer as if they were applicable.

Name:_____

The attached form describes various activities and tasks. Under the column marked "Can Do", check the tasks or activities you expect your husband could do now.

For the tasks you check under "Can Do", indicate in the column marked "confidence" how confident you are that your husband could do the task. Rate your degree of confidence using a number from 10 to 100 on the scale below:

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

Remember, rate what you expect your husband could do and your confidence he could do it now. Even if some of the activities or situations do not seem to apply to him, try to imagine them and answer as if they were applicable.

Lifting objects	Can Do	Confidence
Lift a 10 pound object		
Lift a 20 pound object		
Lift a 30 pound object		
Lift a 40 pound object		
Lift a 50 pound object		
Lift a 60 pound object		
Lift an 80 pound object		
Lift a 100 pound object		
Lift a 120 pound object		
Lift a 150 pound object		
Lift a 175 pound object		

General Exertion		
Capable of very light exertion		
Capable of light exertion		
Capable of moderate exertion		
Capable of hard exertion		
Capable of very hard exertion		
Capable of extreme exertion		

Heart Rate: The following are the usual beats per minute (BPM) for different levels of activity.

Resting:	70 BPM
Moderate activity:	115 BPM
Strenuous activity:	160 BPM

	Can Do	Confidence
Tolerate a HR of 90 - 110 BPM for:		
5 minutes		
10 minutes		
15 minutes		
20 minutes		
Tolerate a HR of 111 - 120 BPM for:		
5 minutes		
10 minutes		
15 minutes		
20 minutes		
Tolerate a HR of 121 - 130 BPM for:		
5 minutes		
10 minutes		
15 minutes		
20 minutes		
Tolerate a HR of 131+ for:		
5 minutes		
10 minutes		
15 minutes		
20 minutes		

Walking	Can Do	Confidence
Walk 1 block (approx. 5 minutes)		
Walk 2 blocks (10 minutes)		
Walk 3 blocks (15 minutes)		
Walk 4 blocks (20 minutes)		
Walk 5 blocks (25 minutes)		
Walk 1 mile (30 minutes)		
Walk 2 miles (60 minutes)		
Walk 3 miles (90 minutes)		
Jogging		
Jog 1 block (approx. 2 minutes)		
Jog 2 blocks (4 minutes)		
Jog 3 blocks (6 minutes)		
Jog 4 blocks (8 minutes)		
Jog 5 blocks (10 minutes)		
Jog 1 mile (12 minutes)		
Jog 1.5 miles (18 minutes)		
Jog 2 miles (24 minutes)		
Jog 3 miles (36 minutes)		

Climbing	Can Do	Confidence
Walk up several steps		
Walk up 1 flight of steps		
Walk up 2 flights of steps		
Walk up 3 flights of steps		
Walk up 4 flights of steps		
Pushing/Moving Things		
Move a light object (kitchen chair)		
Move a medium weight object (Coffee table)		
Move a fairly heavy object (armchair)		
Move a heavy object (sofa or bed)		
***Sex**		
Engage in intercourse (not including foreplay)		
1 - 5 minutes		
6 - 10 minutes		
11 - 15 minutes		
16 - 20 minutes		
more than 20 minutes		

* This item does not mean any given length of intercourse is desirable from a psychological or health standpoint. The time spans mentioned do not take account of the quality of a sexual experience and are not meant as prescriptions.

Driving — Can Do — Confidence

Drive a few blocks in the neigbhourhood
Drive around in residential areas
Drive on a downtown business street
Drive on a main arterial road
Drive on a freeway
Drive on narrow mountain roads

Tolerance of Emotional Tension and Stress

Can tolerate mild tension and stress
Can tolerate some tension and stress
Can tolerale moderate tension and stress
Can tolerate much tension and stress

Tolerance of Anger Arousal

Can tolerale mild anger arousal
Can tolerate some anger arousal
Can tolerate moderate anger arousal
Can tolerate substantial anger arousal
Can tolerate a great deal of anger arousal

Emotional Strain

Listed below are situations that can arouse anxiety, annoyance and anger. Imagine the feelings you might have in each situation, such as your heart beats faster and your muscles tense. Indicate whether you could tolerate now the emotional strain caused by each of the situations.

Can Do — Confidence

Attend a social gathering at which there is no one you know.

At a social gathering, approach a group of strangers, introduce yourself, and join in the conversation.

Be served by a salesperson, receptionist, or waiter whose behavior you find irritating.

	Can Do	Confidence
In a public place, ask a stranger to stop doing something that annoys you, such as cutting in line, talking in a movie.		
In a meeting at work, respond to a colleague who tries to make you look bad or belittles your contributions.		
When very angry let yourself "fly off the handle."		

Family Disagreements

Disagreements with one's spouse can produce emotional strain. Indicate whether you can tolerate as of now the stress caused by a clash of views in each of the areas of marriage listed below.

Disagreements regarding:	Can Do	Confidence
Friends		
Work or outside acitivites		
Handling family finances		
Child care and parenting		
Sex relations		
Diet		