Predictors of Behavioural Risk Factor Modification in Patients Recovering From Acute Coronary Heart Disease

Dissertation
Submitted to the School of Graduate Studies
of the
University of Ottawa
In partial fulfillment of the requirements for the degree of Doctor of Philosophy

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1996

ISBN 0-612-19982-7

Canada

UNIVERSITÉ D'OTTAWA
UNIVERSITY OF OTTAWA

Acknowledgments

First of all I would like to thank the recovering cardiac patients who participated in this study by enthusiastically giving their time in answering the many, and occasionally intrusive, questions. I enjoyed my contact with them and appreciated the notes that many included to apprise me of their progress. I wish them well in their recovery.

I am grateful to the Heart and Stroke Foundation of Ontario for their support of this project, and their facilitation of access to participants. I would like to give special thanks both to my thesis advisor, Dr. Ian Manion, and to Dr. Rob Nolan, who have freely given their expertise and support throughout this process. I have also really appreciated the input and involvement of Dr. Roy Cameron, who acted as my external examiner, and my committee members, Dr. Robert Flynn, Dr. Joyce D'Eon and Dr. Sue Johnson-Douglas who have been readily available and very supportive. My thanks also to Dr. Jack Boulet and Krista Breithaupt for their guidance with my statistical analyses, and not least to Dr. Steve Hotz for helping me to conceptualize this project.

A more personal note to my dear sons, Chris and Ryan. I have been glad of your support and encouragement, and I value your pride in my achievement. I thank Dr. Brian Lee, their father, without whose financial support this would not have been possible. Finally, to Klaus Dellin, my life partner, thank you for your

practical contribution in the design and creation of the data-base for this study, and for your love and support.

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Abstract

This present investigation is a prospective study of 123 cardiac patients who attended a community-based program of education and support, following hospital admission for acute cardiovascular disease. The objective of the study was to derive a predictive model that would maximally discriminate between participants who were vs. participants who were not successful in modifying a health-risk behaviour. The four behaviours examined were following a low-fat diet, performing regular exercise, weight reduction and smoking cessation. Readiness for change was assessed prior to the commencement of the eight-week program, at post-treatment and at five-month follow-up. Participants were grouped into two outcome groups based on their stage of change as delineated by the Transtheoretical Model. Subjects who were in the action or maintenance stages of change at seven-month follow-up were classified as Progressors, and those who were in pre-action stages were classified as Non-progressors.

The variables included in the predictive model were optimism, psychological distress, social intimacy and self-efficacy. Neuroticism was also included to explore its relationship with optimism. Discriminant function analysis showed that the variables that maximally separated individuals who were successful in risk-factor modification from those who were unsuccessful were social intimacy and self-efficacy.

A secondary objective of this study was to compare Progressing subjects with Non-progressing subjects on psychological distress and on two Transtheoretical Model measures, decisional balance and the processes of change. Repeated measures analysis of variance indicated a slight reduction over time in scores on the measure of psychological distress for all participants as a group. However, no differences were found in psychological distress between participants who changed their health-risk behaviour and those who did not. Because more subjects than anticipated were successful in changing their target health-risk behaviour, there were insufficient data to further compare successful changers with unsuccessful changers. Thus the data did not provide for a robust test of how individuals progress through the Transtheoretical model stages of change following a coronary event.

Overall this thesis emphasizes the importance of the social context of behaviour change as evidenced by the contribution of the measure of social intimacy. In addition, this thesis offers some information on the relationship between personality constructs (e.g., neuroticism) and behaviour change, although this requires further investigation.

Introduction

Overview

Coronary heart disease (CHD) remains the leading cause of death in Canada. Seventy nine thousand deaths each year result from this condition, a figure that represents 39 % of all deaths in Canada as compared with 27 % caused by cancer (Nair & Nicholls, 1993). Advances in medical and surgical technology have increased the number of people who survive acute cardiac events, with the result that increasing numbers of patients and their families are learning to adapt to the changes in lifestyle required to lessen the chance of recurrent atherosclerosis or reinfarction. The failure of individuals to adhere to recommended behaviour changes, across clinical settings, is a major concern in health care (Prochaska, 1991). Nonadherence rates for lifestyle modifications such as those prescribed for acute myocardial infarction and cardiovascular by-pass surgery, have been estimated at 50 % (Sackett & Snow, 1979).

The Transtheoretical Model (Prochaska & DiClemente, 1984) has been used effectively with CHD patients in the context of behavioural health-risk factor reduction. This model of change was developed from investigations of how people change problem behaviors by themselves, in their natural environment. Although the model was based on self-changing smokers, research on self-initiated as well as treatment-facilitated change has demonstrated its

reliability, validity and predictive ability across behaviours (Prochaska et al., 1994). The model has also been generalized across demographic groups (Ahijevych & Wewers, 1992), and to groups of ill (including cardiac patients) as well as healthy individuals (Kristellar, Rossi, Ockene, Goldberg, Prochaska, 1992; Lam, McMahon, Priddy, & Gerhed-Schultz, 1988; Ockene et al., 1992). The Transtheoretical model provides a well established framework for understanding *how* people change (processes of change), *when* change is likely to occur (stages of change), and *what* high risk behaviour is changed. However, the model does not account for *who* changes (Fitzgerald, 1990). Research is needed to identify those individuals who are at risk for failure to successfully alter chronic health-risk behaviours.

The present study was an attempt to identify a combination of factors that discriminated between recovering cardiac patients who were successful in modifying a salient health-risk behaviour and those who were unsuccessful. Change was assessed within the framework of the Transtheoretical Model (Prochaska & DiClemente, 1984). The review of the literature led to the inclusion of the following factors in the development of a model to predict successfully maintained behaviour change in patients recovering from acute cardiovascular disease: (1) demographic characteristics (age, gender, socio-economic status), (2) individual differences in personality, (3) medical factors

(degree of perceived functional disability, time lapsed since cardiac event, and type of cardiac event), (4) psychological distress and (5) quality of a close relationship with a supportive person.

This investigation followed, for a period of seven months, a cohort of patients who had recently experienced acute myocardial infarction (AMI) and/or cardiovascular by-pass graft surgery (CABG). These cardiac events represent acute manifestations of cardiovascular disease. The participants were recruited prior to their attendance at a community-based program of education and support for cardiac patients (*Heart to Heart*; Heart and Stroke Foundation)

The goal of the present investigation was to identify characteristics and attitudes that may undermine an individual's potential for success in modifying health-risk behaviours, in order to alert clinicians to those individuals who may need additional intervention. A secondary objective was to compare decisional balance, self-efficacy and use of processes of change (three elements of the Transtheoretical Model) over time between individuals who were successful in changing and those who were unsuccessful. The theoretical relevance was to contribute to existing knowledge concerning the association between personality factors, psychological distress, social support and behaviour change in patients recovering from CHD. In addition the study explored the utility of dispositional

optimism as an independent predictor of successful risk factor modification in patients with CHD.

Change was assessed on the health-risk behaviour selected by subjects as their most salient target behaviour from a choice of (a) consumption of high-fat diet, (b) sedentary lifestyle, (c) failure to maintain an ideal body weight and (d) smoking cigarettes. Subjects were classified into two groups, those who changed and those who did not, based on their self-reported profile of change (as delineated by the Transtheoretical Model) measured at three points in time.

Review of the literature

The review of the literature is divided into five sections. The first presents an explanation of the Transtheoretical Model (TTM) and empirical findings demonstrating its validity, reliability and utility both in research and in clinical interventions for behaviour change. The review of factors that influence coping with acute CHD and risk factor modification includes demographic factors, individual differences in personality, and more immediate predictors of change such as psychological distress and TTM variables: process-use, self-efficacy and decisional balance. The final section of the literature review pertains to the relevance of social support for behaviour change, with a focus on cardiac patients.

The Transtheoretical Model

The Transtheoretical Model is an organizational schema of four interacting variables which are key components of intentional behaviour modification. The four variables are (1) stages of change, (2) processes of change, (3) decisional balance and (4) self-efficacy. This section includes a description of these variables and a discussion of their utility in predicting successful behaviour change. The concept of dynamic typology is introduced.

Stage of change. Retrospective, cross-sectional and longitudinal studies (DiClemente & Prochaska, 1982; Prochaska & DiClemente, 1983; Prochaska, DiClemente, Velicer, Ginpil & Norcross, 1985) have demonstrated that change is characterized by gradual movement through five discrete stages. A stage represents a specific period of time characterized by certain attitudes, intentions and/or behaviors that are relevant to an individual's status in the process of change (Prochaska and DiClemente, 1984). The five stages are: (1) precontemplation, the earliest stage in which people are unaware of having problems, or are unwilling or discouraged when it comes to changing problem behaviours; (2) contemplation, where people are aware of a problem and re-evaluating themselves in light of a target behaviour, but have not yet made a commitment to change; (3) preparation, where individuals are intending to change in the near future, and are on the verge of taking action and need to set goals and priorities

accordingly; (4) action in which people change their overt behaviour and the environmental conditions that affect their behaviour, and (5) maintenance, the stage in which people work to continue the gains attained during action and to prevent relapse to their more troubled level of behavior (Prochaska & DiClemente, 1984). Data consistently indicate that sustained change occurs as a function of the stage individuals are in, with individuals in the early stages significantly less likely to produce the required behaviour change than those in the later stages (Prochaska, 1991; Ockene, et al., 1992).

The stages follow each other in linear progression (Fitzgerald & Prochaska, 1990). In order to progress from one stage to another, an individual must engage in certain stage-specific tasks. For example, to move from precontemplation to contemplation the individual needs to become aware of, and take ownership of, the problem and realize that something must be given up in order to change. Movement to action requires a willingness to alter overt behaviours and environmental contingencies. The tasks to be accomplished in order to achieve movement to the next stage are considered to be invariant (Prochaska & DiClemente, 1986). The linear nature of stage progression was confirmed in cross-sectional studies of self-changing smokers (Prochaska & DiClemente, 1983) and clients presenting for psychotherapy (McConnaughy, Prochaska & Velicer, 1983). Successful change often involves repeated re-

cycling through the stages of change. Prochaska (1991) argues that a spiral model most adequately represents how people change over time; most people relapse on any one cycle through the stages, but learn from their relapses and recycle back through contemplation. Thus, once individuals successfully integrate adaptive behavior into their lifestyles, it is possible for them to exit from the cycle.

Ascertaining the readiness for change (i.e., stage) of an individual has important implications for interventions designed to promote behaviour change. Individuals seeking assistance for change do not always present in the same stage of change, yet their initial stage has significant impact both on participation in intervention programs and on outcome (DiClemente, Prochaska, Velicer, Fairhurst, Rossi & Velaquez, 1991). DiClemente et al. (1991) recruited approximately 1600 smokers to a program designed to promote smoking cessation. Subjects were randomly assigned, stratified by stage, to one of four interventions. Significant between-stage differences in quitting activity and success were found, with precontemplation subjects significantly less successful than preparation subjects. Demographic variables and smoking history did not differ across stages of change in this sample, nor did they predict successful modification of smoking behaviour. Ockene et al. (1992) conducted an intervention study of smokers with heart disease. Their six-month follow-up data revealed that 78 % of the smokers who started treatment in the precontemplation

stage were still smoking after six months, 56 % of the subjects initially in the contemplation stage were still smoking, yet only 20 % of subjects who entered treatment in the preparation or action stages were smoking. These results support the relevance and predictive utility of the stage categories for intervention to promote behaviour change.

Processes of Change. Research has also identified a common set of change processes which are covert and overt coping activities that people select to help themselves modify a particular behaviour (Norcross & Prochaska, 1986; Prochaska & DiClemente, 1983). The ten change processes were derived from Prochaska's (1979) transtheoretical analysis of leading systems of psychotherapy and have been validated in numerous empirical investigations (e.g., Prochaska, Crimi, Lapsanski, Martel & Reid, 1982; Prochaska & DiClemente, 1983; Prochaska et al., 1985). These processes are labelled: consciousness raising, self-liberation, environmental re-evaluation, counter-conditioning, stimulus control, reinforcement management, dramatic relief and helping relationships. Two additional change processes, substance-use and interpersonal systems control, have been identified but not as extensively validated as the other change processes (Prochaska, DiClemente & Norcross, 1992). Change process acts as a critical intervening variable between the stage of change and the production of a new behaviour, such as cessation of smoking (Fitzgerald & Prochaska, 1992).

Empirical research demonstrates that use of processes of change varies by intensity or frequency of occurrence according to stage (Prochaska et al., 1992), with different levels of process-use occurring in different stages (DiClemente & Prochaska, 1985; Prochaska et al., 1992; DiClemente et al., 1991). For example, consciousness-raising, (i.e., acknowledgment of the problem and awareness that change must be made) is necessary for an individual to progress from the precontemplation to the contemplation stage. Self-reevaluation (affective and cognitive re-appraisal of the problem behavior) is a necessary activity during contemplation. Activities such as self-liberation (becoming aware of the ability to choose alternate behaviors), stimulus control, and turning to others for help, are used more frequently by people in the preparation, action and maintenance stages of change (Prochaska et al., 1992). These stage-by-process interactions underscore the importance of stages for understanding (a) the function of specific processes of change, and (b) the overall process of behaviour change.

Statistical analyses of the processes of change have produced two higher order dimensions, each composed of five processes of change. These higher order factors are called the experiential and the behavioural processes of change (Prochaska et al., 1992). The experiential dimension combines the processes that are cognitive and/or affective in nature, such as consciousness raising, self-reevaluation, dramatic relief, environmental reevaluation, and social liberation.

The behavioural dimension comprises the action-oriented change processes, which include counter-conditioning, stimulus control, contingency management, and the helping relationship. This model has been validated across nine problem behaviours, including smoking, weight control, dietary fat reduction, sedentary lifestyle (Rossi, Rossi, Rossi-DelPrete, Prochaska, Banspach, & Carleton 1994). It has also been cross-validated with cardiac patients (Kristeller et al., 1992). There is evidence that individuals who successfully change problem behaviours differ in the degree to which they utilize experiential versus behavioural processes. More specifically, patients who do not progress successfully through the cycle of change tend to over-utilize the experiential change processes (Fitzgerald & Prochaska, 1990).

Decisional balance. Decisional balance, an important construct in health related behaviour change (Janis & Mann, 1977), has been integrated into the Transtheoretical model. Based on Janis and Mann's (1977) comparative approach to balancing decisions, two orthogonal dimensions have been identified, validated, and labeled the "pros" (i.e., positive aspects) and "cons" (i.e., negative aspects) of performing a behaviour (Velicer, DiClemente, Prochaska & Brandenberg, 1985). Decisional balance is derived by comparing the relative strength of the perceived pros and cons of a behaviour. Like the change processes, the pros and cons exhibit differential patterns depending on stage-

membership. In the early (precont mplation) stage, the pros for the problem behaviour are high and the cons are low in importance. In other words, the reasons why an individual continues with the problem behaviour are judged to be more important than the reasons why he or she should stop. However, as the individual moves from precontemplation to the later stages of change, the gap between the pros and cons narrows and shifts. For example, reasons why an individual should continue to smoke become less salient, and reasons why he or she should quit become more salient as the individual moves closer to taking action to stop smoking. As the individual enters the preparation stage the cons begin to outweigh the pros, and the decisional balance remains in favour of the cons throughout maintenance (Prochaska et al., 1993). These findings have been replicated across populations dealing with numerous behaviours including smoking cessation (Velicer et al., 1985), weight control (O'Connell & Velicer, 1988), dietary fat reduction (Rossi, Rossi, Velicer, & Prochaska, 1992) and exercise adoption (Marcus, Rossi, Selby, Niaura & Abrams, 1992).

Self-Efficacy. The concept of self-efficacy has also been explored within the stage model. Bandura (1977) observed that behaviour change is mediated by self-efficacy, or the perception that one has the ability to perform the required behaviour. Self-efficacy beliefs concern the individual's ability to perform in designated behavioural domains; an individual may have strong expectations of

success in one domain yet anticipate lack of success in another (O'Leary, 1992). According to the theory, efficacy expectations determine whether a new behaviour will be initiated and sustained in the face of obstacles. Self-efficacy has been shown to affect the adoption of a variety of behaviours that decrease health-risk including weight reduction (Glynn & Ruderman, 1986), the development of healthy diet and exercise behaviours (Sallis & Hovell, 1990), and cessation of smoking (DiClemente, 1981). Studies exploring the relationship between self-efficacy and the stages of change show that efficacy scores vary significantly as a function of stage, with lowest levels of efficacy ratings in the precontemplation stage and highest levels in maintenance (DiClemente, Prochaska & Gilbertini, 1985; Prochaska et al., 1993; DiClemente & Hughs, 1990).

Transtheoretical model variables as predictors of change. Several studies have been conducted to assess the ability of the four variables (stage, process-use, decisional balance and self-efficacy) to predict successful behaviour change. As stated above, the initial stage of an individual has been shown to predict outcome in both self-initiated and treatment facilitated change across a variety of behaviours. Individuals in the later stages of change are significantly more likely to produce the desired behaviour than those in precontemplation and contemplation stages.

In their prospective study, Prochaska and associates (1994) investigated the utility of (a) the ten change processes (b) decisional balance and (c) self-efficacy as predictors of successful smoking cessation at a six-month follow-up period. The subjects, 866 adults who answered questionnaires every six months for two years, were divided into five groups according to their readiness for change (stage) at the first round of assessment. Analyses demonstrated that the most efficacious predictor variables were self-efficacy, decisional balance and two change processes labeled "self-re-evaluation" and "the helping relationship". More specifically, decisional balance predicted change in subjects in the precontemplation and contemplation stages, and self-efficacy contributed strongly as a predictor of change from contemplation to action and from action to maintenance.

An investigation of the predictive ability of change process-use was conducted in a study of attendance and outcome in a work-site weight control program (Prochaska, Norcross, Fowler, Follick & Abrams, 1992). The sample comprised 184 predominantly female hospital workers. The relative predictive ability of change process-use, self-efficacy, social support, weight history and demographic variables was assessed. Although the authors reported that change processes employed during the early portion of the group treatment were the best predictors of attendance and outcome, social support was the single best pre-

treatment predictor of outcome (i.e., weight lost), accounting for 17 % of the outcome variance. As measured at pre-treatment, the change processes accounted for only two percent of the variance in outcome. However, when measured at mid-treatment they accounted for 20% of the variance in outcome.

Decisional balance has been found to be an important predictor of change across different behaviours and demographic groups (Prochaska et al., 1985; Prochaska et al., 1994; Racowski, Dube, Marcus, Prochaska, Velicer & Abrams, 1992). It is particularly useful as a predictor of change for individuals in the earlier stages of change than those in the later stages, whereas self-efficacy ratings have been found strong predictors of change, but more salient in the later stages of change than the earlier (Prochaska et al., 1992).

Dynamic Typology. A recent conceptual expansion of the Transtheoretical model involves the identification of differential patterns of change or "dynamic typologies" across time (Fitzgerald, 1990; Fitzgerald & Prochaska, 1990; Prochaska, Velicer, Gaudagnoli, Rossi & DiClemente, 1991). The phrase "dynamic typology" simply refers to a group of subjects classified on the basis of some variable that is measured over time. The development of such typologies is based on the stage-state methodology proposed by Runyan (1980). This method poses that individuals can be followed over time and classified into one of several developmental stages at each follow-up interval. Using language

from the Transtheoretical model, the "stage" would refer to the time at which the measurement was taken, and the "state" would refer to the stage of change of the individual. Dynamic typologies for behaviour change have been developed by measuring stage of change across several time intervals, and grouping together individuals who share similar patterns or profiles (Fitzgerald, 1990; Prochaska et al., 1991). The stage-state approach can be used to estimate the likelihood that subjects will follow particular state sequences (Runyan, 1980).

Two recent studies have used dynamic typologies to advance understanding of behaviour change. The first, a longitudinal study of smoking cessation, explored the use of change processes and the mediation of cognitive judgments in 544 adult self-changing smokers (Fitzgerald & Prochaska, 1990). Assessments were made every six months over a two-year time period. Using *a priori* categories, four composite profiles of clinical interest were generated by concatenating (i.e., linking together) stage information across the five rounds of study. Two of the four groups demonstrated stable non-progressing profiles (e.g., contemplation to contemplation) and two showed optimal progress (e.g., contemplation to maintenance).

Fitzgerald (1990) constructed two distinct longitudinal stage typologies to track CHD risk factor reduction in fifty patients scheduled for CABG. Subjects were assessed one month prior to surgery, and at one month and eight months

after CABG. The two stage typologies included a progressing profile which reflected linear progression to at least the action stage and a non-progressing pattern which showed absence of movement or relapse. Patients were grouped by stage of readiness to modify a single CHD risk factor (atherogenic diet, weight or stress management) rated as most problematic at baseline (Fitzgerald, 1990). Sixty four percent of these subjects demonstrated the progressing pattern. The purpose of this study was to explore adaptational outcomes following CABG, and to explore the contribution of health status and control appraisals to risk factor reduction.

Criticism of Transtheoretical Model. The Transtheoretical Model has received some criticism, particularly with respect to the concept of stages (Bandura, 1995; Davidson, 1992). Bandura (1995) asserts that the model arbitrarily sub-divides differences in degree into discrete categories, yet the actual transformation that must take place between stages (e.g., caterpillar to butterfly) does not occur. The model has also been criticised because it does not account for the fact that all individuals do not progress in an orderly way through all stages (Bandura, 1995; Davidson, 1992). Thus, individuals successfully changing without progressing through stages (e.g., those who quit smoking "cold turkey") are not accounted for by this model. The present study was not based on stages,

but rather subjects were grouped according to whether or not they had made the behaviour change they rated as important.

Demographic factors

The Transtheoretical model is robust across different socioeconomic groups. In other words, the functional relationship between the stages and processes of change applies to individuals regardless of socio-demographic variables such as sex, age, level of education, and income (Ahijevych & Wewers, 1992; Prochaska, 1993). In a study of patients recovering from CABG, Fitzgerald (1990) found no significant differences on baseline demographic measures between individuals with progressing profiles and individuals with non-progressing profiles. Other studies provide evidence that socio-demographic characteristics are related to success in modifying high risk behaviours. For example, successful smoking cessation was found to be associated with higher levels of education, occupation and income (Pierce, Fiore, Novotny, Hatziandru & Davis, 1989). Individuals with higher levels of education and income are more likely to exercise, maintain an ideal body weight, and use alcohol appropriately (Lambert, Netherson, Finison, Hyde, & Spaight, 1982). In summary, there are mixed findings in the literature regarding the contribution of demographic factors to risk factor modification.

Individual differences in personality

Recently, research has focused on the role of generalized expectancies in self-regulation and adjustment to illness (Scheier & Carver, 1985; Scheier, Weintraub & Carver, 1986; Taylor, Kemeny, Aspinwall, Schneider, Rodriguez & Herbert, 1992). This work is based on Carver and Scheier's (1982) model of behavioural self-regulation, according to which individuals who have expectations of successful outcomes (i.e., optimists) will renew their efforts to attain set goals when confronted with disruption of their goal-directed efforts. In contrast, individuals whose expectancy is more negative (i.e., pessimists) are likely to reduce or cease efforts when confronted with similar disruption (Scheier & Carver, 1985). Dispositional optimism is defined, then, as the general expectancy that good as opposed to bad outcomes will generally occur when confronting problems across important life domains (Scheier & Carver, 1985). From this perspective, optimists would attempt to solve or cope actively with problems they encounter, whereas pessimists would adopt more pessimistic or fatalistic approaches and disengage from problems. Adjustment to illness would then be mediated by the differential coping strategies used by optimists and pessimists.

These hypothesized differences in coping styles between optimists and pessimists were explored in two studies comparing explanatory style with the

Ways of Coping Checklist (WCCL; Folkman & Lazarus, 1980). Scheier, Weintraub and Carver (1986) found that dispositional optimism, as measured by the Life Orientation Test (LOT; Scheier & Carver, 1985) was associated with more problem-focused coping and seeking of social support, and less avoidance or disengagement. Lin and Peterson (1991) used the Expanded Attributional Style Questionnaire (EASQ; Peterson & Villanova, 1988), a different measure of the construct of optimism, and concluded that individuals with pessimistic explanatory style fail to take active steps (such as changing diet, taking vitamins etc.) to relieve symptoms of illness. It appears that optimists and pessimists spontaneously use different coping strategies when confronted by challenging situations.

A number of studies have explored the relationship between health, coping and dispositional optimism using the LOT. Carver and Gaines (1987) reported a significant inverse relationship between high levels of dispositional optimism scores and post-partum depression. Strack, Carver and Blaney (1987) found that high LOT scores were associated with a greater likelihood of completing an alcohol treatment program. A study of homosexual males responding to the threat of Acquired Immunodeficiency Syndrome (AIDS) found that high LOT scores were associated with less avoidant coping (Taylor et al., 1992).

Three studies have used the LOT in studies of patients recovering from CABG (Fitzgerald, 1990; Maroto, Shepperd and Pbert, 1990; Scheier et al. 1989). Scheier and associates (1989) demonstrated that dispositional optimism is an important predictor of post-surgical coping efforts, well-being and rate of recovery. The LOT was found to differentiate between individuals' post-surgical coping style. Optimists were more likely to set goals for recovery and to seek information about the required medical regimen, while pessimists were more disengaged from post-operative goals. Caution must be used interpreting the findings from this study, however, because baseline data were gathered one day prior to CABG and the post-operative assessment point was only six to eight days after surgery. The proximity of data collection to the time of surgery may have influenced patient responses. Fitzgerald (1990) found that global optimism predicted positive affect and a decrease in angina and membership in the progressing profile of change. Finally, an unpublished study cited in Scheier, et al (1989) and in Fitzgerald, Tennen, Affleck and Pransky (1993), reported that optimism was associated with greater success in lowered levels of cholesterol and increased weight control and exercise in patients attending a cardiac rehabilitation program (Maroto et al., 1990).

Taken together, these studies generate support for the importance of measuring dispositional optimism in studies of risk factor modification after

CHD. That is, they support the premise that optimism is (a) associated with active problem-focused coping and seeking social support, and (b) inversely correlated with a tendency to ruminate on negative emotion and emotional expression. Pessimism, on the other hand, is related to the adoption of coping strategies that imply disengagement from active coping strategies and a tendency to focus on negative emotions.

Data on the convergent and discriminant validity of the LOT, compiled by Scheier and Carver (1985) with respect to hopelessness, depression and self-esteem were interpreted as evidence that the construct measured by the LOT is distinct from other conceptually similar constructs (Scheier & Carver, 1985). However, several researchers have questioned this interpretation of the data, and have further explored the ability of the LOT to discriminate between dispositional optimism and other variables (Smith, Pope, Rhodewalt, & Poulton, 1989; Marshall & Lang, 1990; Mroczek, Spiro, Aldwin, Ozer and Bosse, 1993).

Two studies were conducted with undergraduate university students to evaluate the convergent and discriminant validity of the LOT relative to neuroticism (Smith et al., 1989). Neuroticism was measured using the Taylor Manifest Anxiety Scale (TMAS; 1953) and the trait form of the State-Trait Anxiety Scale (A-Trait; Spielberger, Gorush & Lushene, 1978). The Generalized Expectancy for Success Scale (GESS; Fibel & Hane, 1989) was included as a

second measure of the concept of optimism. Subjects also completed the Revised Ways of Coping Checklist (RWCCL; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985) and a physical symptoms questionnaire. Data analyses revealed significant positive correlations between the LOT, the second measure of optimism (GESS) and also the measures of neuroticism. When neuroticism was statistically controlled, higher LOT scores were not associated with lower physical symptom reporting nor higher problem-focused coping. However the association between the LOT and seeking social support remained. The authors concluded that previously established symptom reporting and coping behaviour correlates of optimism reflect the pervasive, established personality dimension of neuroticism. Scheier and Carver (1993) have responded to the concerns raised regarding the discriminant validity of the LOT relative to neuroticism. They argue that neuroticism is a multi-faceted construct which consists partly (although not entirely) of pessimism, and suggest that only the pessimism facet of neuroticism may be relevant to the effects found in research.

Marshall and Lang (1990) examined the empirical independence of optimism and perceived personal control, which they operationalized using the self-mastery scale developed by Pearlin and Schooler (1978). Their factor analyses indicated that, although there is overlap between the two constructs, optimism and self-mastery are two empirically and conceptually distinct

constructs. A subsequent confirmatory factor analysis of the LOT items indicated that rather than representing opposite ends of a continuum, optimism and pessimism may actually be separate constructs. This premise was further investigated in a study of the association between the LOT and self-reports of hassles, psychological symptoms and illness severity in a sample of 1,192 males aged over 41 (Mroczek et al., 1993). Two sets of multiple regression analyses with forced entry were used to determine whether bipolar optimism as well as separate optimism and pessimism were associated with the above criterion variables. In the first, self-reports of hassles, psychological symptoms and illness severity were each regressed on optimism. In the second, the regression was repeated for each criterion variable with neuroticism included, to determine whether they attenuated the relation between optimism and the external criterion. Extraversion and neuroticism were measured using a short form of the Eysenck Personality Inventory. Optimism was found to have an independent negative relation with hassles while pessimism had no relation. Both optimism and pessimism had independent relations with self-reported psychological symptoms and illness severity; optimism's was negative. However, when extraversion and neuroticism were included (a) the relation between illness severity and optimism was eliminated, and (b) the other relations were attenuated but not eliminated. Mroczek et al. (1993) concluded that optimism and pessimism are separate

constructs which are distinguishable from neuroticism, but that there is a degree of overlap between the constructs that varies according to the criterion variable.

There is still uncertainty whether effects found in research on optimism and health derive from a variable other than optimism. The argument of Scheier and Carver (1993) that pessimism may be the one facet of neuroticism responsible for effects found in research would suggest that the LOT may be a parsimonious and precise tool for predicting coping activities. Nonetheless, future studies of the role of optimism should consider the potential confounding effects of neuroticism. No empirical research has statistically controlled for these constructs in studies of the role of dispositional optimism in coping with coronary heart disease.

Psychological Distress

A factor more proximally related to behaviour change is the individual's current level of psychological distress. A large body of data documents the significance of symptoms of anxiety and depression in recovery from AMI and CABG (Blumenthal & Emery, 1988; Cay & Walker, 1988; Gundle, Bozman, Tate, Raft and McLaurin, 1980; Havik & Maeland, 1990; Langelddecke, Fulcher, Baird, Hughs & Tennant, 1989; Magni et al., 1987). Given their propensity to experience high levels of anxiety and depression, CABG and AMI patients may fail to meet the demands of lifestyle change imposed by their altered health status. Depressive symptomatology is consistently reported as a major predictor of poor long-term outcome, including failure to return to work and social activities for AMI patients (Fielding, 1991) and CABG patients (e.g., Dierdericks, Bar, Hoppner, Vonken, Appels & Wellens, 1991; Maeland & Havik, 1987; Mayou, 1986). Symptoms of anxiety and depression are also associated both with poor levels of adherence to treatment regimens (Meichenbaum & Turk, 1987). Emotional distress has been identified as a predictor of noncompliance with exercise regimens (Blumenthal, Williams, Wallace, Williams, & Needels, 1982).

Success in modifying risk factor behaviours may be associated with reduced psychological distress. For example, Roviaro, Holmes and Holsten (1984) found that 28 patients participating in a structured exercise program

reported a more positive self-perception and better psychosocial functioning than those in a non-randomized comparison group. Other studies have, on the other hand, failed to find any long-term advantage of exercise on various psychosocial measures (e.g., Stern & Cleary, 1982). Fitzgerald (1990) found that behavioural risk reduction was a significant predictor of mood, measured using the Positive and Negative Affect Schedule, with progressing stage profile subjects showing better emotional adjustment than non-progressing individuals.

Social Support

The social support literature has directed attention to the importance of interpersonal relationships in health, with different models conceptualizing the impact of social support on health in various ways. Main effect models predict that social support influences health by: a) providing information related to appropriate health behaviours, b) increasing self-esteem and perceptions of control, leading to greater motivation to care for oneself, c) positively or negatively influencing health-risk behaviour patterns, and d) providing tangible resources (Cohen, 1988). Stress buffering models incorporate the concept that the negative effects of stressful situations are diminished by perceived social support (Cohen, 1988). The social strain model (Rook, 1990) posits that the *quality* of interpersonal relationships may affect health and well-being.

The marital relationship, a primary avenue for obtaining social support, is recognized as an important predictor of adjustment to illness and subsequent coping behaviour (Burman & Margolis, 1992; Campbell, 1986; Waltz, 1986). There is substantial evidence that being married is related to a greater chance of survival once illness is diagnosed (e.g., Berkman & Syme, 1979). Numerous researchers have acknowledged the importance of the marital relationship in recovery from AMI and CABG, the wife having been described as the primary supporter of the patient (Beach et al., 1992) and as the most important determinant of successful adjustment following AMI (Mayou 1986).

Social support in relation to recovery from CABG was investigated in a prospective longitudinal study of 155 CABG patients and 103 spouses (King, Reis, Porter & Norsen, 1993). Five different types of perceived support (appraisal, esteem, belonging, closeness and tangible) were measured to determine their impact on emotional and functional patient outcomes. Only esteem support (making the person feel valued, loved and competent) had a substantial independent relationship with emotional and physical well-being. These authors concluded that the perception of esteem support is the salient factor in recovery from CABG. This finding is consistent with the premise that confiding and intimacy is a major vehicle through which social support influences well-being (Wills, 1991).

Intimacy attachment in the marital relationship was explored in a study of 600 male AMI patients and their spouses (Waltz, 1986). Patients in high-intimacy marriages reported significantly higher levels of subjective well-being and feelings of mastery than unmarried subjects, or subjects in low-intimacy marriages. Patients who were dissatisfied with their marital relationships reported that they did not feel that they meant very much to their wives, and could not disclose their illness-related concerns and fears. Waltz, Badura, Pfaff and Schott (1988) investigated the role of patient health cognitions and marital factors in a sample of approximately 400 men recovering from AMI, and examined the availability and provision of social support, operationalized as intimacy attachment, in the marital relationship. Intimacy was inversely related to the patients' level of depressed mood. The intimacy variable discriminated between individuals with moderate levels and individuals with severe levels of depressed mood when existing health problems were statistically controlled for. These data suggest that supportive marital environments, characterized by high intimate attachment and low conflict, provide a buffering effect against adjustment problems in the recovery phase of CHD (Waltz et al., 1988). Dissatisfaction with the marriage on the other hand, was an important determinant of patient dysphoria one year after AMI. Waltz and associates (1988) suggest that stress in

marriage and the failure to receive emotional support may hinder effective coping behavior.

Ben-Sira and Eliezer (1990) also investigated spousal support, in a study of 63 Jewish males recovering from a first AMI. This study attempted to develop a model to predict factors impeding or enhancing adjustment following AMI. Contrary to their expectations, these authors found that spousal support was a crucial determinant of successful adjustment and 'habit breaking'. 'Habit breaking' referred to smoking cessation and change of dietary habits. Two salient types of spousal support were investigated. The first was instrumental support, defined as "perceived persuasion to gradually relinquish the sick role and assume normal functioning". The second was encouragement, defined as "perception of their spouses' sincere concern and encouragement together with understanding, love, and fostering a feeling of security". This study was confined to Israeli society, and therefore an issue of importance is the generalizability of these findings to other cultural groups.

Although the above studies have not focused specifically on risk factor modification, it appears that effective coping behaviours are associated with intimate, supportive relationships. Risk factor modification is one facet of coping. Health-related behaviors such as consumption of healthy food, level of exercise, and use of tobacco and alcohol are influenced by marital factors (Cohen,

1988). For example, successful smoking cessation has been linked to positively supportive behaviours from the spouse (Cohen, 1988), and the ability to maintain smoking abstinence over 30 to 60 days has been linked to the perceived availability of someone with whom to discuss problems (Mermalstein, Cohen, Lichtensein, Kamark, & Baer, 1986). A study of attendance and outcome in a work-site weight control program demonstrated social support was the single best baseline predictor of weight loss, accounting for 17 % of the variance (Prochaska et al., 1992). Wives of cardiac patients have been shown to play an important role in risk factor modification by appropriately providing information and advice, facilitating social interaction and encouraging the expression of emotions and personal concerns (Rogers, 1987). The research on social support and treatment adherence supports the premise that it is not the availability of social contacts, but the quality of these contacts which influence the individual's ability to cope with distress and adhere to treatment regimens (Meichenbaum & Turk, 1987). Spouses who are intrusive, nagging or guilt-inducing can precipitate the undesired effect of treatment nonadherence (Meichenbaum & Turk, 1987).

A recent study examined the independent relationships of emotional support and marital status with adherence to medical instruction concerning ambulation and smoking cessation, as well as depression, anxiety and perceived quality of life (Kulik & Mahler, 1993). Eighty-five male CABG patients were

followed for 13 months following discharge from hospital. Emotional support was assessed using a four-item questionnaire which apparently was developed for the study. The authors reported that two of these four items constitute the "emotional ties" sub-scale of the Mental-Health Inventory (Veit & Ware, 1983). Modification of smoking and exercise habits was assessed by self-report, with cross-validity data obtained from 37 wives. Multiple regression of marital status and support on outcomes demonstrated that marital status was unrelated to outcomes. However, social support was significantly inversely related to number of cigarettes smoked, and significantly positively related to ambulation. These findings should be replicated in the context of risk factor modification following CHD using a validated measure of emotional support.

The data suggest that although being married is related to better adaptation after AMI or CABG, it is the quality of the marriage that determines its benefits. This finding is consistent with the social strain model (Rook, 1990). Overall, studies of social support in cardiac recovery justify the hypothesis that intimacy is an important factor in re-adjustment, coping and risk factor modification following AMI and CABG.

Summary

The review of the literature explored several factors that have been identified as important in health-risk behaviour modification. These are

demographic factors (i.e., age, socio-economic status), optimism, psychological distress and social support, and the Transtheoretical Model variables: decisional balance, self-efficacy and the use of processes of change. Conclusions drawn from this review are now briefly summarized.

There were mixed findings concerning the contribution of demographic variables to risk-factor reduction, although research using the Transtheoretical Model has found no association between demographic variables and success in behaviour change (e.g., Fitzgerald, 1990). Consequently, these variables were measured in the present study, but not expected to play a predominant role in predicting behaviour change.

Optimism has been associated with active problem-focused coping in patients recovering from cardiac surgery (Scheier et al,. 1989), and has been identified as a factor in risk-factor modification in this population (Scheier et al., 1992). The role of optimism in behavioural risk-factor reduction among recovering cardiac patients therefore warrants further investigation. Because the distinction between optimism and the personality trait neuroticism has not yet been clarified, a measure of neuroticism was included to control for potential confounding effects of this trait.

Numerous studies have indicated that symptoms of anxiety and depression may interfere with optimal recovery from AMI and CABG (e.g., Dierdericks et

al., 1991; Havik & Maeland, 1990; Langelddecke et al., 1989). Depressive symptomatology is consistently reported as a major predictor of poor long-term outcome, including failure to return to work and social activities for AMI patients (Fielding, 1991). Symptoms of anxiety and depression are also associated both with poor levels of adherence to treatment regimens (Meichenbaum & Turk, 1987). Emotional distress has been identified as a predictor of noncompliance with exercise regimens (Blumenthal et al., 1982. The contribution of psychological distress to the prediction of behaviour change was therefore evaluated in the present study.

The importance of social support in recovery from cardiac disease and in health-risk behaviour change has been well documented (Cohen, 1988; King et al., 1993). Further, it is likely that the availability of a close relationship that provides emotional support plays a substantial role in supporting the required behaviour change following acute cardiovascular disease (Kulik & Mahler, 1993; Waltz, 1986). One form of social support was measured in this study using an instrument designed to assess the quality of a close intimate relationship.

The Transtheoretical Model variables (i.e., decisional balance, self-efficacy and process-use) were discussed as predictors of change. Decisional balance has been found to be effective in predicting change for individuals in earlier stages of change (i.e., precontemplation, contemplation) rather than those

in later stages (i.e., action, maintenance). On the other hand, self-efficacy contributes strongly as a predictor in later stages rather than earlier stages (Prochaska et al., 1985). Given that it was anticipated that, in the present study of recovering cardiac patients, there would be more individuals in the later stages of change (preparation, action or maintenance), only self-efficacy was considered as a predictor of change. Process of change-use was identified as predicting change at a mid-treatment assessment in a study of weight loss reduction, but failed to predict success at baseline (Prochaska et al., 1992). Because the present investigation focused on pre-treatment predictors of successful change, process-use was not considered as a predictor of change.

Research Hypotheses

In consideration of the literature review the following hypotheses were proposed:

Major Hypothesis

1. A number of variables, measured at pretreatment, associated with success in modifying CHD behavioural risk factor modification have been identified. A predictive model can be derived, based on a subset of the indicated predictor variables, that will maximally discriminate between outcome groups (i.e., Progressors vs. Non-progressors). Within this framework, it can also be determined whether certain variables uniquely contribute to this discriminant function after taking into account the effects of other variables. After controlling for Neuroticism, the following pretreatment scores will each be unique contributors to the prediction of membership in the progressing or non-progressing group:

(a) dispositional optimism, measured using the Life Orientation Test (Scheier & Carver, 1985);

(b) social intimacy, measured using the Miller Social Intimacy Scale (Miller & Lefcourt, 1982);

(c) state psychological distress, measured using the Brief Symptom Inventory (BSI; Derogatis, 1993).

(d) self-efficacy measured using behaviour-specific measures from the Transtheoretical Model.

Secondary Objectives

A secondary objective of this study was to explore the following research questions, where numbers permitted. The following questions were derived from the Transtheoretical model

1. Do Progressors and Non-progressors have a different pattern of change (if any) over time on measures of:

(a) use of experiential processes of change

(b) use of behavioural processes of change

(c) decisional balance

(d) psychological distress.

Method

Subjects

Subject Pool: *Heart to Heart* Program

The participants in this study were post-acute phase cardiac patients who had experienced acute myocardial infarction (AMI) and/or cardiovascular bypass surgery (CABG), and who participated in *Heart to Heart.* This community-based program for cardiac patients and their partners (or a relative or close friend) is a standardized program of education and support, developed and sponsored by the Heart and Stroke Foundation of Canada. *Heart to Heart* programs are conducted in six provinces of Canada, but the present study was limited to the Province of Ontario.

Thirty-eight sites throughout Ontario were approached to participate in this study. Because of administrative reasons (e.g., insufficient staff or lack of participants) data were not gathered from twelve sites. The 26 centres that did participate included Bowmanville, Brampton, Brockville, Burlington, Cornwall, Dunville, Etobikoke, Hamilton, Ingersoll, Kirkland Lake, Leamington, Lindsay, London, Mississauga, Newmarket, Ottawa, Peterborough, Sarnia, Scarborough, Seaforth, St. Catharine's, St. Thomas, Sudbury, Toronto, Timmins and Wingham A variety of communities were therefore represented including large urban centres and rural locations, representing a 70 % participation rate by site. Clients

attended the *Heart to Heart* programs on their own initiative or by referral from the hospitals where they received treatment for their cardiac condition.

Intervention. *Heart to Heart* runs once a week for eight consecutive weeks, with each session lasting for approximately two hours. The first session is an introductory session and the last serves as a wrap-up and termination session. The other six provide information on (a) the heart and coronary artery disease, (b) diet, (c) exercise and weight loss, (d) emergency situations and medication (e) emotions following cardiac disease and (f) stress management. Further details of this program are provided in Appendix A. A series of eight videos provides standardized information and acts as a catalyst for the group process. Group learning takes place through a combination of individual participation and leader facilitation. Some sites use speakers to cover the material or supplement the videos. There is no clear distinction between the two types of group since most sites use a combination of videos and expert speakers. Because of the lack of clear definition between intervention format, group types were amalgamated in the present study. A conservative test of differences between these group types was performed to justify pooling participants. No differences were found by medical or demographic variables across group types. These results are reported in Appendix B.

Recruitment

Recruitment of subjects occurred between September 1994 and May 1995.

Inclusion criteria. Participants met the following inclusion criteria:

1. a diagnosis of one AMI and/or have undergone CABG one time only
2. experience of above events within one year of participation
3. age between 30 - 75 years
4. ability to complete written tests in English
5. no current medical treatment for chronic disabling conditions other than cardiovascular disease or diabetes
6. no current psychotherapy for depression
7. a self-reported level of alcohol intake not suggestive of a diagnosis of alcoholism (six or more drinks/day; Kristellar et al., 1992)

For the majority of participants recruitment was as follows: *Heart to Heart* clients meeting initial inclusion criteria (age, type and timing of cardiac event, ability to participate in English) were invited to participate in the study by either the local Heart and Stroke Foundation office or the group facilitator at least one week (and no longer than one month) prior to the commencement of the *Heart to Heart* group. Potential participants were informed that the Heart and Stroke Foundation of Ontario would donate heart-healthy cookery books to 20 people who returned three completed questionnaire packages. Those who agreed to

participate gave verbal consent for their telephone numbers to be forwarded to the researcher. Written consent was obtained with the first questionnaire package (see Appendix C). All subjects were recruited by the second week of the program, the first being an orientation session. For a minority of participants (N = 18) the group was invited to participate on the first night of *Heart to Heart* and the telephone numbers of those who agreed to participate were forwarded to the researcher.

Potential participants were then contacted by telephone by the researcher who fully explained all requirements for participation and answered their questions. Participants were further screened (concurrent treatment for depression or disability, alcohol consumption, and other chronic disability) and the researcher ensured that subjects met all eligibility criteria. At this point in the procedure, four subjects declined to participate. No information was provided by the Heart and Stroke Foundation on the number and characteristics of those clients who were ineligible or unwilling to participate.

Attrition

One hundred and seventy-six cardiac patients initially agreed to participate in this study but 15 subjects were lost when their *Heart to Heart* groups were cancelled due to insufficient registration, reducing the original subject pool to 161. One hundred and fifty-six subjects completed the first

questionnaire package. Five patients failed to return the initial questionnaire package because they "changed their minds about participating in the study". Over the seven-month period of data collection, 34 more subjects dropped out of the study. Reasons given for dropping out included (a) decided not to attend *Heart to Heart* (7 subjects), (b) decided not to participate in the study (9 subjects), (c) belief that the questions were not relevant to them (2 subjects), and not feeling well enough, or too busy, to participate (12 subjects). The researcher was unable to contact three subjects, and one individual died during the course of the study. A total of 122 individuals participated in the study. The rate of attrition in this study was therefore 24 %.

Data Collection Protocol

Questionnaire packages were administered to participants on three occasions: prior to *Heart to Heart*, immediately following *Heart to Heart*, and at five-month follow-up (i.e., seven months after the first round of questions). The questionnaire packages were sent by mail with postage-paid envelopes provided for return. All first questionnaire packages were received back from participants prior to the second *Heart to Heart* session. (The first session is an introductory session). If participants did not return subsequent questionnaires within one month they were reminded by telephone. Data collection occurred between September 1994 and December 1995.

Variables and Measures

The measures administered at each time are outlined in Table 1.

Table 1
Measures Used and Measurement Schedule

Measures	Time 1 *Pre-Treatment*	Time 2 *Post-Treatment*	Time 3 *5 Month Follow-up*
Demographic			
Age	x		
Gender	x		
Marital status	x		
Education	x		
Occupation	x		
Medical			
Type of Event	x		
Time Since Event	x		
Functional Capacity (DASI)	x		
Choice of Target Behaviour	x		
Neuroticism (NNEO)	x		
Dispositional Optimism (LOT)	x		
Intimacy (MSIS)	x		
Psychological Distress (BSI)	x	x	x
Transtheoretical Measures *(Behaviour Specific)*			
Stage of Change	x	x	x
Processes of Change (POC)	x	x	x
Decisional Balance (Pros & Cons)	x	x	x
Self-efficacy (Confidence)	x	x	x

Demographics and Medical Information

Background information was gathered by a short questionnaire (please see Appendix D). This information included demographic data (age, gender, marital status, educational level, employment status) and medical information (cardiac diagnosis, time lapsed since cardiac event, and functional capacity).

The Duke Activity Status Index (DASI, Hlatky et al., 1989) was administered to assess functional capacity. The DASI is a 12-item self-administered questionnaire which provides standardized assessment of functional capacity of cardiac patients and aspects of quality of life. The DASI measures the respondent's ability to perform activities of daily living such as personal care, ambulation, household tasks, sexual function and recreational activities. Scoring of the DASI results in a continuous measurement which permits detection of small differences in functional capacity. This test was developed for use with cardiovascular patients, and has been found to correlate significantly with peak oxygen testing, an objective measure of exercise capacity ($p<.0001$). The validity of the scale was determined by correlating DASI scores with scores obtained from an independent sample of 50 subjects. The Cronbach alpha coefficient for the present sample was .86. The DASI is included as Appendix E.

Neuroticism

Neuroticism is defined as a broad dimension of individual differences in the tendency (a) to experience negative distressing emotions, and (b) to possess associated behavioural and cognitive traits (Costa & McCrae, 1987). A measure of this trait was included to control for its effects on dispositional optimism in predicting success in modifying health-risk behaviour. Neuroticism was measured using the Neuroticism (N) scale from the NEO-FFI (Costa & McCrae, 1991). The NEO-FFI is a 60-item instrument developed as a short form of the NEO-Personality Inventory (NEO-PI), and is a reliable and widely validated measure of the five domains of personality (Costa & McCrae, 1992). The NEO-FFI consists of five 12 item scales that measure the personality domains of Neuroticism , Extraversion, Openness, Conscientiousness and Agreeableness. Scales contain equal numbers of positively and negatively keyed items. Internal consistency for the NEO-FFI scale is acceptable. The coefficient alpha for the N scale is reported as .86 (Costa & McCrae, 1992), and for the present sample the coefficient alpha was .84. The validity of the scales was originally determined by correlating NEO-FFI scores with scores obtained three years previously on a measure of the five-factor model (Costa & McCrae, 1992). Despite the passage of time, the convergent correlations between measures were acceptable. The

correlation between the N scales was .62, $p < .001$. This questionnaire is included as Appendix F.

Dispositional Optimism

The Life Orientation Test (LOT; Scheier & Carver, 1985) was used to measure dispostional optimism. This test was included to determine the role of dispositional optimism in changing health-risk behaviours in this population. The test consists of 12 items, of which four are filler items, four are keyed positively, and four are keyed negatively and reversed prior to scoring. Respondents were asked to endorse the extent to which they agree with each item along a 5-point continuum (4 = strongly agree, 0 = strongly disagree). Scheier and Carver (1985) report an acceptable Cronbach alpha coefficient of .76, and a test-retest correlation of .79. The Cronbach alpha coefficient for the present sample was .72. This questionnaire is included as Appendix G.

Psychological Distress

Level of psychological distress was assessed using the Global Severity Index of the Brief Symptom Inventory (BSI; Derogatis, 1993). This is a 53-item self-report symptom inventory with nine primary symptom dimensions: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychotism. There are three global indices of distress: the global severity index (GSI), the positive

symptom distress index and the positive symptom total. The BSI manual indicates that, across symptom dimensions, alpha reliabilities range from .71 to .85 and test-retest reliabilities from .68 to .91. The global indices, however, have high test-retest reliabilities of .80 to .90. The GSI provides the most sensitive indicator of the respondent's level of psychological distress and this was the only index used in the present study, due to the high inter-correlations between the nine symptom dimensions. The Cronbach alpha coefficient for the present sample was .96. This questionnaire is included as Appendix H.

Social Support

This construct was measured using the Miller Social Intimacy Scale (MSIS; Miller & Lefcourt, 1982). This self-report measure of social intimacy, designed to assess the degree of closeness in the context of a significant interpersonal relationship requires that subjects rate their closest relationship on 17 items. Six of these items require frequency ratings, and 11 require intensity ratings; both types are on 10-point scales. Miller and Lefcourt (1982) have reported that the Cronbach alpha coefficient for the MSIS is .91 and that test-retest reliability is significant ($r = .96$, $p < .001$). The Cronbach alpha coefficient for the present sample was .89. This questionnaire appears in Appendix I.

Selection of target behaviour

Four recovery behaviours were targeted for investigation: (1) following a low-fat diet, (2) performing regular exercise, (3) smoking cessation and (4) weight reduction. Participants were invited to choose which of these they most needed to change. Based on the question **"Now that you have heart problems, which behaviour do you most need to change?"** they were directed to answer a colour-coded response booklet (yellow for diet, blue for weight, green for exercise and pink for smoking) depending on their choice. Respondents were instructed to leave the other booklets blank and return them to the researcher.

Stage of Change

At all three times of measurement, participants rated their readiness to change their target behaviour using the Transtheoretical Model algorithm pertinent to each specific behaviour (Marcus, Selby, Niarura & Rossi, 1992; Prochaska & DiClemente, 1991; Rossi, Rossi, Velicer & Prochaska, 1993). Each algorithm comprises a brief series of self-report questions assessing intentions and current activities with regard to the behaviour in question. The purpose of the algorithms is to unambiguously classify an individual into one of the stages of change. This categorical classification system has been shown to be reliable and valid across a diverse set of problem behaviours including diet, exercise, weight and smoking (DiClemente et al., 1991; Marcus et al., 1992; Prochaska &

DiClemente, 1991; Rossi et al., 1993). Adequate test-retest reliability has been demonstrated (r = .78; Marcus et al., 1992). The staging algorithms for each behaviour are included as Appendix J.

Self-report measures of behaviour change were used for several reasons. First, many researchers favor the use of self-report measures because external validation is not always accurate (e.g., Petitti, Friedman & Kahn, 1981; Velicer, Prochaska, Rossi & Snow, 1992). Velicer et al. (1992) report that, in studies where there is minimal intervention (as opposed to intensive face-to-face contact) self-reports of behaviour change are likely to be accurate. For the present study, with subjects recruited from different areas in the Province of Ontario, external validation would be difficult and costly to obtain. The strategy of obtaining verification of behaviour change from an informant (the partner or relative of each subject) was considered but disregarded for two reasons. First, the accuracy of this information would still be unknown, and if there was disagreement it was unclear whose answer would be selected. Second, this approach would eliminate those subjects who had no partner available.

Processes of Change

Respondents rated their use of change processes at all three data collection points using the Processes of Change (POC) questionnaire relevant to their target behaviour (Rossi et al., 1992; Marcus et al., 1992; Prochaska et al., 1992). The

POC questionnaires are designed to measure the covert and overt activities individuals use to make lifestyle changes. The POC questionnaires measure the ten different coping strategies for change (i.e., change processes) presented in the literature review.

The POC questionnaires vary in length (dietary fat 31 items, exercise 38 items, weight 48 items, smoking 40 items) but are uniform in format (five-point Likert scale inventories). Two additional processes of change (interpersonal systems control and substance-use) are included in the dietary fat and weight measures. Because these change processes have received less theoretical and empirical support than the other change processes (Prochaska et al.,1992), and because they are not common to all POC questionnaires (across behaviours measured in this study) these items were excluded from the analyses.

Principal components analyses have supported the factor structure of the POC questionnaires (Prochaska & DiClemente, 1985; Marcus, Rossi & Selby, 1992; Rossi et al., 1993). Coefficient Alpha estimates calculated to estimate the degree of internal consistency for the sub-scales ranged from .73 to .90, indicating adequate overall internal consistency (Rossi & Rossi, 1992). For the present sample the Cronbach alpha coefficient was .92. Appendices K, L, M and N include the behaviour-specific booklets for diet, exercise, weight and smoking.

These contain the processes of change, decisional balance and self-efficacy questionnaires.

Decisional Balance

The gains and losses associated with behaviour change were measured using the Decisional Balance Inventory (DBI) specific to each respondent's target behaviour (O'Connell & Velicer, 1988). The diet, weight and smoking versions contain 20 items and the exercise version has 16 items. All measures use a five-point Likert format and contain two sub-scales that measure the "pros" (positive aspects) and "cons" (negative aspects) of change. All decisional balance inventories have demonstrated two clear principal components reflecting the pros and cons, and a high internal consistency with coefficient alphas ranging from .84 to .91. For the present sample the Cronbach alpha coefficient was .85.

Self-Efficacy

Participants rated their confidence in their ability to make the behaviour change using the self-efficacy questionnaires designed for their target behaviour. Reliability data for the self-efficacy measures report internal consistency coefficients ranging from .76 - .90 (Rossi et al., 1993). For the present sample the Cronbach alpha coefficient was .90. Again, these measures vary in length according to the behaviour. The smoking and weight measures have 20 items (Velicer, DiClemente, Rossi & Prochaska, 1990; Rossi, et al., 1993), the diet 12

items (Rossi et al., 1992) and the exercise measure has five items (Marcus et al., 1992). The sub-scales of these measures differ across behaviours and therefore, in keeping with conventional practices (DiClemente et al., 1985; Prochaska et al., 1991)), global self-efficacy was measured using the summary score on these measures. To arrive at a score across behavioural measures, self-efficacy was calculated by dividing the subject's summary score on the test by the number of items in the test.

Grouping Variables

Subjects were assigned to the **progressing** or **non-progressing** stage profile, depending on self-reported stage of change across the three time periods of study. A stringent criterion for change was used: subjects **must have progressed to the action stage by Time 3 to be included in the progressing group.** This criterion was used because subjects had experienced acute cardiac disease, had attended *Heart to Heart* which provides information regarding health-risk behaviour modification, and had selected a target behaviour they defined as salient. Research with self-changers and smokers suggests that a period of 10 weeks is ample time for individuals to begin to take action (Prochaska, et al., 1992).

Progressing subjects were therefore those who progressed to action or maintained action over the eight-month study period. Fitzgerald (1990) also used

this criterion for membership in the progressing change profile group. Non-progressing subjects included those who failed to move to action, or those who relapsed regardless of whether they were in action at some point during the study.

Ethical considerations

The data for the present study were collected as part of the evaluation of *Heart to Heart* for the Province of Ontario. Participants were advised on the information and consent form that all information gathered during the investigation would be kept in strict confidence. They were also informed that they were free to withdraw from the study at any time if they so wished. Participants understood that, should they refuse to participate in the study, their decision would in no way affect their treatment as they took part in the rehabilitation program. Precautions were taken to ensure that information collected from participants remained confidential and was examined only by the researchers.

Experimental Design

The present study was prospective in design following a cohort of cardiac patients. The study employed a 2 (Groups: Progressors/Non-progressors) by 3 (Times: pre-treatment/post-treatment/five month follow-up) mixed factorial design.

Data Analyses

Data analyses were conducted using SPSS for Windows, Standard Version (Release 6.1, 1994). Data analyses included three phases, the preliminary analyses, testing of major the hypothesis, and exploratory analyses. Exploratory analyses are described after the results section.

Preliminary Analyses

The preliminary analyses included (a) descriptive analyses and (b) analyses of design assumptions (collapsing across gender, choice of target behaviour and type of group). For the preliminary analyses, t-tests, chi-square tests and analyses of variance were conducted. Significant differences between groups were identified if the parametric or nonparametric statistics had a p value of $\leq .05$.

Outcome Groups. Consistent with the design of the research, subjects were classified into outcome groups based on their stage of readiness for change across time intervals (Time 1, Time 2, Time 3). Subjects in action or maintenance at Time 3 were grouped as Progressors and those who failed to reach action, or who relapsed to a pre-action stage were grouped as Non-progressors. Medical and demographic differences between these groups were explored using the ANOVA procedure with chi-square analyses and t-tests where appropriate.

Of the subjects who responded to all three questionnaire packages, 106 reported that they had changed their target behaviour and only 17 (13 %) reported that they were unsuccessful. Twenty subjects who did not return all three questionnaire packages were contacted by telephone to assess their stage of change. Among these subjects the percentage of failure to change rose to 40%. Eight individuals reported relapse in their target behaviour and 12 reported success. The subjects who were reached by telephone were included in the analyses only requiring baseline data and stage of change at Time 3 (the grouping variable).

Assumptions. A preliminary investigation of the data was conducted to ascertain that the assumptions of linearity, normality and equal variances were not violated. Levine's test for equal variances between outcome groups (Progressors vs. Non-progressors) revealed no threat to planned group comparisons. Normality of distribution was tested using Lillefor's (or the Kolmogorov-Smirnov) two sample test of normality. Univariate distributions did not differ significantly from the normal curve. For the multivariate assumption of homogeneity of variance-covariance matrices, Box's M test and the log determinants of the sum of squares matrices were computed for both the discriminant function analysis and the exploratory analyses. Measures in the multivariate analyses did not have significant outlying or extreme cases.

Major Hypothesis

The predictive model of factors, postulated in Hypothesis 1 to mediate behaviour change, was tested with a step-wise discriminant function analysis to determine which of the predictor variables maximally discriminated between outcome groups. Criterion for entry into the discriminant function was set as Wilk's Lambda. Forced entry, step-wise analysis was selected to ensure that any significant contribution of Neuroticism could be evaluated independently of other independent variables.

For this analysis, group sizes were adequate in terms of relative group size and ratio of variables to cases. There were greater than 20 cases in the smallest group as recommended by Tabachnik and Fidell (1989, p.511) and greater than 20 subjects per variable as recommended by Stevens (1996, p 265). Using the Solo Power Analysis program (SPA; Hintze, 1992), it was determined that there was adequate power to detect a true moderate difference in outcome groups of unequal sizes (111 Progressors, 25 Non-progressors) for the five independent variables of interest ($\alpha = .05$, $\beta = .17$, $P = .80$).

Results

Preliminary Analyses

Characteristics of Study Sample

From the subject pool of 161, 156 subjects returned the first questionnaire package (attrition was addressed in the Methods section). Seventy five percent of the study sample were males ($N = 117$) and 25% were females ($N = 39$). Age was normally distributed, ranging from 35 to 74 years ($M = 56$, $SD = 11.9$). The majority of the subjects ($N = 128$) were married or in common-law relationships. Only 9 had never married, 11 were separated or divorced, and 8 were widowed. Seventy eight percent of participants experienced only AMI and 9% underwent only CABG. Twelve percent of subjects had both AMI and CABG. All were first cardiac events and all occurred less than one year prior to the study. For most subjects ($N = 113$), the event occurred during the four months before they took part in the study.

Participants versus dropouts. To determine the possible effect of subject self-selection in this study, and to aid generalizability of these findings to other *Heart to Heart* clients, subjects who dropped out at any time over the course of the study were compared with those who fully participated. Chi-square analyses and t-tests were used to compare participants and dropouts on demographic variables (age, gender, level of education, occupation and marital status). These

analyses indicated that there were no significant differences on demographic variables, as shown in Table 2. Participants and dropouts were then compared on medical variables (type of cardiac event, time since cardiac event and functional capacity) using chi-square tests and analysis of variance (ANOVA; $N = 142$). These analyses also indicated no significant differences on medical variables.

The two groups were further compared on baseline levels of psychological distress, neuroticism and optimism, as well as self-efficacy, decisional balance and change process-use using analysis of variance. Again no significant differences were identified. Participants and dropouts were also compared on choice of target behaviour and stage of change and a statistically significant difference on choice of target behaviour was found. Subjects who dropped out of the study were less likely to have chosen weight reduction than participants and more likely to smoke ($\chi^2(3) = 8.109$, $p = .043$). These data are summarized in Table 2.

Table 2

Descriptive Data and Significance Tests on Time 1 Demographic/ Medical Variables and Health-risk Behaviour for Participants and Dropouts

		Participants $N = 122$	Dropouts $N = 34$	Statistic	Significance
Demographics	**Gender** *(Percent)*				
	Males	76.3	72.5	χ^2 (10) = .23	NS
	Females	23.7	27.5		
	Age				
	Mean	57.0	55.3	t (153) = .69	NS
	Standard Deviation	11.3	13.3		
	Marital status *(Percent)*				
	Single	5.2	5.0		
	Married/common law	85.2	75.0	χ^2 (3) = 3.46	NS
	Divorced/separated	6.1	10.0		
	Widowed	3.5	10.0		
	Level of Education *(Percent)*				
	High School	69.6	77.5		
	Post High School	30.4	22.5	χ^2 (1) = .92	NS
Medical Factors	**Cardiac Event** *(Percent)*				
	AMI	74.8	87.5		
	CABG	11.3	5.0	χ^2 (2) = 2.83	NS
	AMI & CABG	13.9	7.5		
	Time Since Event *(weeks)*				
	Mean	11.0	10.8		
	Standard Deviation	8.9	9.8	F (1) = .68	NS
	Functional Capacity *(DASI)*				
	Mean	22.1	21.0	F (1) = .26	NS
	Standard Deviation	13.0	13.2		
Health-risk Behaviour	**Target Behaviour**	46.1	46.2		
	Diet	25.2	28.2	χ^2 (3) = 8.1	p = .04
	Exercise	16.5	2.6		
	Weight	12.2	23.1		
	Smoking				
	Stage of Change				
	Precontemplation	0.0	2.6		
	Contemplation	8.8	12.8		
	Preparation	14.9	20.5	χ^2 (4) = 7.5	NS
	Action	54.4	53.8		
	Maintenance	21.1	11.1		

Continued on next page.

Table 2 Continued

		Participants $N = 122$	Dropouts $N = 34$	Statistic	Significance
Psychological Variables	**Psychological Distress** *(BSI)*				
	Mean	40.0	39.9	$F(1, 138) = .28$	NS
	Standard Deviation	2.3	2.7		
	Neuroticism *(NNEO)*				
	Mean	67.7	68.0	$F(1, 138) = .05$	NS
	Standard Deviation	6.8	7.7		
	Dispositional Optimism *(LOT)*				
	Mean	34.7	33.0	$F(1, 138) = .15$	NS
	Standard Deviation	10.2	8.6		
	Intimacy *(MSIS)*				
	Mean	50.1	49.7	$F(1, 138) = .06$	NS
	Standard Deviation	10.3	9.1		
TTM Measures	**Pros of Change**				
	Mean	59.7	59.7	$F(147) = .47$	NS
	Standard Deviation	9.6	9.0		
	Cons of Change				
	Mean	59.5	59.5	$F(147) = .36$	NS
	Standard Deviation	1.0	1.7		
	Self-efficacy				
	Mean	58.2	58.3	$F(147) = .13$	NS
	Standard Deviation	1.2	1.3		
	Experiential POC				
	Mean	11.7	11.6	$F(147) = .09$	NS
	Standard Deviation	3.1	3.0		
	Behavioural POC				
	Mean	10.8	11.1	$F(147) = .90$	NS
	Standard Deviation	5.8	5.6		

Results

Choice of Target Behaviour. The target behaviour was described by subjects as that which they most needed to change. The most frequently selected target behaviour was reduction in dietary fat (chosen by 46% of participants) followed by adoption of exercise (25% of participants). Smoking cessation and weight reduction were chosen respectively by 12% and 13% of participants.

Stage of change across time. As can be seen from Table 3, over time the grouped stage of change shifted away from earlier stages of change (contemplation, preparation) towards action and maintenance. At baseline, the majority of subjects (54%) reported that they were in action and this number increased (58%) by the end of *Heart to Heart* at Time 2. The decrease in action at Time 3 reflects the progress into maintenance of action subjects who sustained their efforts. There was one subject in precontemplation at pre-treatment and at follow-up.

Table 3
Distribution of stage of change across time

	Time 1 *Percent; N = 156*	Time 2 *Percent; N = 128*	Time 3 *Percent; N = 122*
Precontemplation	< 1	0	< 1
Contemplation	10	5	3
Preparation	16	15	10
Action	54	58	20
Maintenance	18	22	66

Results

Outcome groups

One hundred and six (86%) of the subjects who returned all three questionnaire packages reported success in modifying their target behaviour, and 17 (14%) reported lack of success. However, of the 20 subjects whose outcome data were obtained by telephone, 12 subjects (60%) were successful and 8 subjects (40%) were unsuccessful in changing their target behaviour. Thus, of the 143 cases available for testing Hypothesis 1, 118 were in the Progressing group and 25 were in the Non-progressing group.

Comparison of sub-groups: gender, group type and choice of target behaviour. The data were analyzed to determine if there were initial differences on the classifying variables (i.e., Progressors vs. Non-progressors) by type of group (i.e., video vs. speaker), gender, and choice of target behaviour. Progressors and Non-progressors did not differ by type of group. Although gender differences were found in this sample (see Appendix P for a complete description of gender differences), males and females were equally represented among Progressors and Non-progressors. Because these sub-groups did not differ on the classifying variable, they were amalgamated across gender for later analyses. However, Progressors and Non-progressors did differ by choice of target behaviour with Progressors significantly more likely to choose diet and Non-progressors significantly more likely to choose smoking (χ^2 (3) = , p .003).

Because of this difference, following the initial discriminant function analysis, exploratory analyses were performed by target behaviour where number of subjects permitted.

Demographic and medical differences between outcome groups. To determine whether subjects in the Progressing group differed from subjects in the Non-progressing group on demographic variables (age, gender, level of education, occupation, marital status), chi-square analyses and t-tests were performed. These analyses indicated that the two groups did not differ on demographic variables. Progressors and Non-progressors were then compared on medical variables (time since cardiac event, type of cardiac event and perceived functional capacity) using chi-square analysis and analysis of variance ($N = 138$). Results of evaluation of assumptions of normality, homogeneity of variance-covariance matrices, linearity and multicollinearity were satisfactory. Again, no significant differences were found. These data are presented in Table 4.

Table 4

Descriptive Data and Significance Tests on Time 1 Demographic, Medical Factors and Choice of Target Behaviour for Progressors and Non-progressors

		Progressors $N = 118$	Non-Progressors $N=25$	Statistic	Significance
Demographic	Gender (percent)				
	Males	76.0	24.1	χ^2 (1) .29	NS
	Females	81.0	19.2		
	Age				
	Mean	56.6	57.0	t (140) = -.17	NS
	Standard Deviation	11.2	9.9		
	Marital status (percent)				
	Single	4.3	7.9		
	Married/common law	84.4	80.7	χ^2 (3) = 2.79	NS
	Divorced/separated	6.0	11.5		
	Widowed	5.0	0.0		
	Level of Education (percent)				
	High School	70.6	69.2	χ^2 (1) = .02	NS
	Post High School	29.3	30.7		
Medical					
	Time Since Event (weeks)	10.4	12.5	F (1) .27	NS
	Functional Capacity (DASI)				
	Mean	21.7	23.5	F (1) .26	NS
	Standard Deviation	12.9	13.0		
	Cardiac Event (per cent)				
	AMI	74.1	88.4		
	CABG	10.3	7.6	χ^2 (2) = 2.89	NS
	AMI & CABG	15.5	3.8		
Target Behaviour	(per cent)				
	Diet	52.5	23.1		
	Exercise	23.3	26.9	χ^2 (3) = 14.6	p .003
	Weight	13.8	11.5		
	Smoking	10.3	38.4		

Results

Correlations among variables

Table 5, showing the correlation matrix for the variables measured in the discriminant function analysis, is followed by a brief description of the most salient correlations. A more comprehensive correlation matrix is included as Appendix O.

Table 5
Correlation Matrix for Variables in Discriminant Function Analysis
N = 152

	NNEO	LOT	BSI	MSIS	SE
LOT Optimism	-.65**				
BSI Psychological Distress	.59**	-.51**			
MSIS Intimacy	-.27**	.19	-.21		
SE Self-Efficacy	-.25**	.19	-.22	.03	
OUTCOME Prog. vs. Non-prog.	.22*	-.17*	.13	-.38**	-.15

Note
* p < .05 ** p < .01
(Progressors coded as 1; Non-progressors coded as 2)

Neuroticism was significantly associated with all of variables measured in the discriminant function analysis. Participants who scored higher on the Neuroticism scale tended to have lower levels of optimism, self-efficacy and intimacy and higher levels of psychological distress. Optimism, as measured by the LOT, was negatively associated with current psychological distress. Subjects

with higher levels of social support and optimism, and lower neuroticism scores were more likely to be in the progressing group.

Testing of Hypothesis 1

A step-wise discriminant function analysis was performed to determine which of the following variables maximally discriminated between progressors and Non-progressors: neuroticism (NNEO), optimism (LOT), psychological distress (BSI), self-efficacy (SE) and social support (MSIS).

As discussed earlier, the data were examined to ensure adequacy of power, group size and freedom from violations of the assumptions for this procedure. Stepwise analysis was selected to ensure that any significant contribution of neuroticism could be evaluated independently of other independent variables. The five variables were forced into the analysis in the following order, based on the theoretical rationale outlined earlier: NNEO, LOT, BSI, MSIS and SE.

The resultant discriminant function was defined only by the NEO, the MSIS and the SE scores. The MSIS score was dominant in describing the discriminant function, with a standardized discriminant function coefficient of .88. The SE score had a considerably lower standardized discriminant function coefficient of .32, and the NNEO score had a standardized discriminant function coefficient of -.22. Based on these three variables, correct classification was

achieved for 85 % of cases. The canonical correlation for the whole function was .45, Wilk's $\lambda = .8$ $p < .001$. Examination of the mean scores indicates that subjects in the progressing group had lower NNEO scores, and higher SE and MSIS scores when compared with subjects in the Non-progressing group. Selected output from this analysis are presented in Table 6.

Table 6

Discriminant Analysis For Hypothesis 1.
Total N = 136. Progressing Group N = 112. Non-progressing Group N = 24

Group Means and Standard Deviations

	Progressors		**Non-progressors**	
	M	SD	M	SD
Neuroticism	50.91	10.57	57.65	11.95
Optimism	51.15	9.27	46.19	11.60
Psychological Distress	39.79	2.13	40.88	3.16
Intimacy	51.75	9.19	40.74	10.35
Self-efficacy	58.28	1.09	57.79	1.62

F to Enter at Step 0	**F Value**
Neuroticism	7.35
Dispositional Optimism	4.98
Psychological Distress	4.18
Intimacy	25.94
Self-Efficacy	3.25

Step 1 Neuroticism included in analysis	F Values of other variables after Step 1
Dispositional Optimism	.41
Psychological Distress	.39
Intimacy	20.11
Self-Efficacy	1.37

Discriminant Function (1)

Eigenvalue	% Variance	Cumulative %	Canonical R^2	Wilk's λ	Chi-Square	DF	Sig.
.25	100	100	.45	.8	28.08	3	.0000

Standardized Discriminant Function Coefficients

	Function
Neuroticism	-.22
Intimacy	.88
Self-efficacy	.32

Structure Matrix (Pooled within-group correlations)

Intimacy	.90
Neuroticism	-.48
Psychological Distress	-.35
Dispositional Optimism	.34
Self-efficacy	.32

Percent of "grouped" cases correctly classified: 84.62%

Exploratory Analyses

A secondary objective of this study was to explore differences between outcome groups (Progressors and Non-progressors) on the Transtheoretical variables (self-efficacy, decisional balance and use of change processes) and psychological distress across time. Unfortunately, only 17 subjects classified as Non-progressors responded at all three data collection points, resulting in too small a sample to test the secondary hypotheses. Three sets of exploratory analyses were therefore conducted. The first set was considered necessary to further explore the difference in proportions of choice of target behaviour in the outcome groups. Second, in the absence of sufficient data to explore the hypothesized differences over time between Progressors and Non-progressors, it was decided to compare these outcome groups on one variable only. Finally, it was considered important to look at the Progressors group for changes over time which might be meaningful for clinical interpretation.

Effects of Choice of Target Behaviour

To explore the effect of choice of target behaviour, discriminant function analysis was repeated using only subjects who were changing their diet or their weight. The decision was made to combine these two target behaviours because it could be reasonably argued that both choices require similar behaviours - control of eating habits. It is plausible that contemporary values might influence

women to opt for weight reduction while men might more often choose to follow a low fat diet. In the present sample a greater proportion of women chose weight reduction (27% of females vs. 9% of males) while a greater proportion of men chose reduction of dietary fat (50% of males vs. 32 % of females) (χ^2 (3) = , p .003). However, when these choices of target behaviours were combined, the combined data encompassed 59% of the male and 59% of the female participants. This combination produced a sufficient number of cases to proceed with discriminant function analysis. The discriminant function analysis was therefore replicated using only the weight and diet categories in an attempt to eliminate the influence of choice of target behaviour (e.g., smoking).

Prior to conducting the second discriminant analysis, the new data set (subjects in the diet and weight categories only) was checked for violations of the assumptions for this statistical procedure. The Box's M test was found to be significant, meaning that the variance-covariance matrices were significantly dissimilar. A decision was made to proceed with the analysis because examination of the log determinants revealed that increased variability was associated with the larger group, suggesting that differences were an artifact of group size (Klecka, 1980; p.61). Further, based on the first discriminant function analysis (where all four target behaviours were considered), it was reasonable to assume that in the general population of Progressors and Non-progressors in this

study, the sampling distribution of means would satisfy the assumption of normality needed for inferential statistical tests. Finally, the criterion for multivariate significance would be based on Pillais' criterion which is robust to differences in group size (Tabachnik & Fidell, 1983, p. 249).

Table 7, shows the correlation matrix for the variables measured in the discriminant function analysis using only data from subjects modifying diet and weight.

Table 7
Correlation Matrix for Variables in Discriminant Function Analysis
$N = 83$

	NNEO	LOT	BSI	MSIS	SE
LOT Optimism	-.62**				
BSI Psychological Distress	.54**	-.48**			
MSIS Intimacy	-.26**	.14	-.14		
SE Self-Efficacy	-.24*	.18	-.03	.12	
OUTCOME Prog. vs. Non-prog.	-.00	.05	-.15	-.37**	-.14

Note
* $p < .05$ ** $p < .01$
(Progressors coded as 1; Non-progressors coded as 2)

Results

The discriminant function analysis procedure was replicated using only those participants who were trying to reduce their weight and their dietary fat (*N* = 91). The same method was used, that is stepwise analysis with the five variables forced into the analysis in the following order: NNEO, LOT, MSIS, BSI and SE. The discriminant function resulting from this analysis was defined by the MSIS and the BSI scores. The MSIS scores were again dominant in describing the discriminant function, with a standardized discriminant function coefficient of .90. The BSI scores had a standardized discriminant function coefficient of .39. Based on these variables, correct classification was achieved for 89.4 % of cases. The Canonical correlation for the whole function was .40, Wilk's $\lambda = .84$ $p < .001$. Examination of the group means indicates that subjects in the progressing group had higher BSI and MSIS scores when compared with subjects in the Non-progressing group. Selected output from these analyses are presented in Table 8.

Table 8

Results of Discriminant Function analysis using only Diet and Weight Subjects
$N = 83$; Progressing Group $N = 74$ Non-progressing Group $N = 9$.

	Progressors		Non-progressors	
	M	SD	M	SD
Neuroticism	51.41	10.45	51.38	9.42
Optimism	51.25	9.94	51.54	8.43
Psychological Distress	39.93	2.17	39.25	1.71
Intimacy	52.00	9.34	39.48	11.97
Self-efficacy	57.93	.57	57.66	.42

F to Enter at Step 0	**F Value**
Neuroticism	.0000
Dispositional Optimism	.0060
Psychological Distress	.71
Intimacy	12.20
Self-Efficacy	1.75

Step 1 Neuroticism included in analysis	F Values of other variables after Step 1
Dispositional Optimism	.01
Psychological Distress	.96
Intimacy	13.08
Self-Efficacy	1.85

Discriminant Function (1)

Eigenvalue	% Variance	Cumulative %	Canonical R^2	Wilk's λ	Chi-Square	DF	Sig.
.19	100	100	.40	.84	12.98	2	.002

Standardized Discriminant Function Coefficients

	Function
Psychological Distress	.39
Intimacy	.90

Structure Matrix (Pooled within-group correlations)

Intimacy	.92
Psychological Distress	.22
Neuroticism	-.07
Self-efficacy	.01
Optimism	.00

Percent of "grouped" cases correctly classified: 89.4%

Results

Changes over time between Progressors and Non-progressors

A factorial repeated measures analysis of variance (RM ANOVA) was performed to determine if there was a different pattern of change over time (if any) for Progressors and Non-progressors, in scores on the measure of psychological distress ($N = 114$). There were no significant differences in the pattern of scores on the measure of psychological distress for Progressors vs. Non-progressors over time. The univariate tests of Time 1 scores vs. Time 2 scores was also not significant. However, time contrasts did identify a significant difference between the averaged Time 1/Time 2 psychological distress scores when compared with the Time 3 scores ($F (2, 11) = 3.7$, $p = .03$). The cell means indicated that psychological distress decreased over time. These results are summarized in Table 9.

Table 9

Results of Repeated Measures Analysis of Variance for Psychological Distress by Outcome Group (Progressors, $N = 98$; Non-progressors, $N = 16$).

Mean Scores and Standard Deviations at each Time for Progressors and Non-progressors

	Time 1	Time 2	Time 3
Progressors ($N = 98$)			
Mean	39.86	39.76	39.37
Standard Deviation	2.23	2.49	2.10
Non-progressors ($N = 16$)			
Mean	40.66	41.11	40.45
Standard Deviation	2.68	3.33	2.41
Total Sample ($N = 114$)			
Mean	39.97	39.95	39.52
Standard Deviation	2.30	2.65	2.17

Univariate Tests of Significance

	F	DF	Sig. of F
Progressors, Non-progressors	3.4	1,112	.07
Prog., Non-Prog. by Psy. Distress	.73	2, 111	.48
Change in Psychological Distress	3.7	2,111	.03*

Time Contrast Tests

Changes: Time 1 - Time 2	.57	1, 112	.45
Changes: Time 1/2 - Time 3	.59	1,112	.02*

Note * = $p > .05$

Changes over time within the Progressors group

Finally, it was considered important to look at the Progressors group (N = 115) for changes over time which might be meaningful for clinical interpretation. Repeated measures analysis of variance (RM ANOVA) was performed for all Transtheoretical Model variables: self-efficacy, decisional balance ("pros" & "cons"), and the use of both experiential and behavioural processes of change. Examination of the assumptions of linearity, sphericity and multivariate normality suggested that the robustness of the analysis would not be compromised. Changes over time were identified if multivariate F values for Wilk's lambda were found to be significant. The sample size for this procedure was 99. Contrasts of Time 1 versus Time 2, and Times 1/2 versus Time 3, were used in the event that significant main effects were found, in order to determine where changes occurred.

Main effects were found only for the "pros" of change variable, which was found to change significantly when Time 3 scores were compared with the average means of Times 1 and 2 (F (1, 97) = 9.18, p = .003). During this time there was a significant increase in scores on the measure of the "pros" of change. Other variables were not found to change significantly over time. These results are summarized in Table 10.

Table 10
Repeated Measures Analyses for Transtheoretical Measures using only Progressing Group.

Measure	Omnibus F	DF	Significance
Pros of Change	4.65	1, 97	.01*
Cons of Change	.03	1, 97	.19
Self-Efficacy	0.3	1, 94	.21
Behavioural POC	.00	1, 94	.97
Experiential POC	0.2	1, 97	.34

* significant difference found when Time 3 scores were compared with the average means of Times 1/ 2: $F(1, 97) = 9.18$, $p = .003$.

Discussion

The purpose of this research was to develop a predictive model of factors that mediate behavioural risk factor modification following acute coronary heart disease (CHD). Specifically, the purpose was to determine which among the following variables would maximally discriminate between outcome groups (i.e., Progressors vs. Non-progressors): (1) neuroticism, (2) dispositional optimism, (3) social support, (4) psychological distress, and (5) self-efficacy. Change was assessed on the health-risk behaviour selected by subjects as their most salient target behaviour. The discussion initially focuses on the major hypothesis of the study, then addresses the characteristics of the sample before discussing the exploratory analyses. Finally the strengths and limitations of this study as well as its research and clinical implications are discussed.

Hypothesis 1: Predictors of Health-risk Modification

It was hypothesized that a predictive model could be derived from pre-treatment measures of the identified variables that would maximally separate individuals who were successful in changing their chosen health-risk behaviour (Progressors) from those who were unsuccessful (Non-progressors). An assumption underlying this hypothesis was that the prediction could be made across the following behaviours: (a) reduction of dietary fat, (b) reduction of weight, (c) smoking cessation and (d) adopting an appropriate exercise regimen.

Discussion

Analysis showed that the group of successful changers was characterized by higher scores on measures of social support and self-efficacy (with regard to the target behaviour) than the group of unsuccessful changers, and lower scores on the measure of neuroticism. The measure of social intimacy carried most of the discriminating information ($\beta = .88$). Self-efficacy ($\beta = .32$) and neuroticism ($\beta = -.22$) also contributed to the discriminant function. The predictor variables included in this research are discussed individually below.

Social Support

The measure of social support was most important in separating those who were successful in changing their target high-risk health behaviour from those who were not successful. This finding is consistent with a growing body of data acknowledging the importance of social support as a predictor of healthy psychological and physiological functioning. Studies of patients recovering from coronary heart disease (CHD) have found that social support has a positive impact on emotional adjustment following heart attack and by-pass surgery (c.f. Ben Sira & Eliezer, 1990; King et al., 1993; Waltz et al., 1988). There is empirical support for the premise that the spouse is the primary source of social support, and the most important determinant of adjustment to illness and subsequent coping behaviour in cardiac patients as well as other illness groups (Berkman & Syme, 1979; Burman & Margolis, 1991; Campbell 1986; Gilliss, 1984; Waltz, 1986).

Discussion

A variety of models have been proposed to characterize the links between social support and health. The *main effects* and *stress buffering* models described by Cohen (1988) were discussed earlier in this paper. Different kinds of support (e.g., provision of information, tangible support, emotional support) have been demonstrated as distinctive contributors to emotional and physical health (King et al., 1993). In her social strain model, Rook (1990) has stated that to achieve a more comprehensive understanding of how social bonds affect emotional and physical health it is important to pay attention to the negative as well as the positive exchanges that occur within a social network. Rook suggests that it is the quality of the social network that determines its beneficial aspects.

The quality of the marital environment was explored in the context of recovery from acute AMI by Waltz (1986). Waltz developed instruments to measure high and low marital intimacy and marital conflict in recovering married male cardiac patients. These measures appeared to explain differences in adjustment to cardiac disease on a measure of subjective well-being. Those patients in supportive marital environments characterized by high intimate attachment and low conflict perceived that they were coping more effectively with the after effects of their illness than those who reported marital dissatisfaction.

Discussion

The concept of social support was narrowed in the present study to embrace only the concept of emotional closeness with another individual. Social support was measured using the Miller Social Intimacy Scale (MSIS; Miller & Lefcourt, 1982), an instrument developed specifically to measure intimacy. The questions were generated from systematic interviews with 50 undergraduate students in an attempt to specify some of the determining characteristics of relationships they considered to be intimate. The questions assess the ability to confide in, to understand, and to feel close to the important person, as well as the importance of that person in the life of the respondent. The questions were asked in the context of an interpersonal relationship chosen by the respondent, and participants were instructed to think of someone special in their lives, for example a spouse, partner or close friend.

It is noteworthy that, in the present study, marital status was equally represented in the outcome groups. Successful and unsuccessful changers did not differ in terms of marital status but differed strongly in terms of their described intimate relationship. This suggests that successful changers included those in higher intimacy marriages as well as single, widowed or divorced individuals who had an intimate bond with another important person. On the other hand, the unsuccessful group included individuals who were married but did not report the same level of intimate relationships. This finding is consistent with the work of

Kulik and Mahler (1993) who found that marital status was unrelated to smoking cessation whereas emotional support was significantly inversely related to number of cigarettes smoked. It is also congruent with the social strain model of social support (Rook, 1990).

The outcome variable in this study included only change in modification of a health-risk behaviour chosen by the respondents as that which they needed to change. Kulik and Mahler (1993) were the first to document the role of emotional support in risk-factor modification among male patients recovering from cardiovascular by-pass surgery. It is perhaps an indicator of the importance of emotional support that these researchers were able to capture its significance using a four-item questionnaire that they constructed for their study. Prochaska et al. (1992) have suggested that being open about one's feelings and being understood by others may be a particularly helpful process for individuals at high risk for relapse. Research on social support and treatment adherence supports the conclusion that it is the quality of social contacts that influences treatment adherence (Meichenbaum and Turk, 1987, p 212).

It must be considered that the study participants were predominantly male, married, and working on dietary fat reduction, and also attending a psycho-educational program for recovering cardiac patients and partners. It has been observed clinically that wives of male patients usually take responsibility for

providing low-fat foods for their cardiac spouse (Levin, 1987, p. 29). It is likely that the wives played a very important role in supporting this behaviour change.

It must also be considered that the relationship between social support and behaviour change may be motivational. In other words, those individuals having a close relationship also had more reason to take steps to prolong their lives.

Self-Efficacy

The self-efficacy scores of participants in relation to their target behaviour were useful in separating successful changers from those who were unsuccessful in the first discriminant function analysis. This finding is congruent with Bandura's (1986) premise that self-efficacy evaluations influence behavioural performance. It is also consistent with the findings of Prochaska et al. (1985) that self-efficacy contributes to the prediction of change from contemplation to action, and action to maintenance.

However the role played by self-efficacy was smaller than expected, given other research (Prochaska et al., 1985; Marcus et al., 1992), and was not significant when the discriminant function analysis was repeated using only the diet and weight data. Two factors could account for this finding. First, as a group, the subjects in the present study rated very highly their confidence in their ability to make the required changes. The mean scores on the measures of self-efficacy were high, with little variablity. A second contributor to the relatively

small role played by self-efficacy could be the central role of the spouse in the present population. Numerous authors have cited the important role of the spouse in the recovery period following CHD (e.g., Ben Sira & Eliezer, 1990; Coyne & Smith, 1991; Gortner et al., 1988). The spouse has been described as the crucial determinant of successful adaptation in the recovery period (Beach, et al., 1992). Wives of cardiac patients frequently take most of the responsibility for their husband's diet, taking great pains to learn how to purchase and prepare low-fat foods (Levin, 1987). We suggest that the subjects in the present study (75% males of whom over 50% were targeting low-fat diet) relied very heavily on their wives to provide the optimal diet, with the result that their own perceived self-efficacy with regard to the behaviour change was not an important issue.

Neuroticism

Neuroticism was retained in the discriminant function as a predictor of change across the designated health-risk behaviours, but with a small standardized discriminant function coefficient ($\beta = -.22$). This indicates that, in the company of social support and self-efficacy neuroticism had little relative importance. Caution is recommended in interpreting standardized discriminant function coefficient values of less than .30 (Stevens, 1996, p 272; Pedhauzer, 1973, p. 705). In addition, the neuroticism scores did not contribute to the discriminant function when the analysis was repeated using data from the subjects

modifying their diet and weight. It would therefore be important to replicate the present findings with a similar sample before drawing conclusions regarding the contribution of neuroticism to risk factor modification across the behaviours investigated in the present study.

No studies have been found that examine the contribution of neuroticism as a predictor of risk factor modification in patients recovering from acute CHD. However, behavioural traits associated with this personality dimension are reported to include poor inhibition of impulses, helplessness and difficulty in coping with stressful situations (Costa & McCrae, 1987; Costa, Krantz, Blumenthal, Furberg, Rosenman & Shekelle, 1987). This would suggest that individuals high in neuroticism might experience difficulty in modifying health-risk behaviours. The relation between success in health-risk behaviour modification and neuroticism therefore merits further investigation.

Optimism

It was hypothesized that optimism would uniquely contribute to the prediction of success in modifying health-risk behaviours. Contrary to our hypothesis, optimism as measured by the Life Orientation Test (LOT) did not predict modification of high risk behaviours in the present investigation. In the company of the other variables considered in the discriminant function analysis, the LOT was not retained in the discriminannt function. However, it is important

to note the fairly large negative correlation between neuroticism and optimism scores ($r = -.65$, $N = 152$, $p < .01$) and the smaller correlation between optimism and outcome ($r = .17$, $N = 152$, $p < .05$; see Table 5). The present findings do not support previous reports that optimists are more likely to be engaging in positive health habits after acute heart disease (Fitzgerald, 1990; Maroto et al., 1990; Scheier & Carver, 1992), although with a larger sample size, and without controlling for neuroticism, previous findings might be replicated. The present findings support the importance of controlling for neuroticism in studies investigating the predictive value of optimism, measured using the LOT.

Neuroticism and optimism

The substantive literature indicates a lack of clear distinction between optimism and neuroticism (e.g., Smith et al., 1989). A significant negative correlation was found between the measures of Neuroticism and the LOT ($r = -.65$, $N = 152$, $p < .01$) with subjects obtaining lower scores on neuroticism tending towards higher scores on the measure of optimism. Thus, the significant degree of overlap between these two constructs found in previous research was replicated in the present study. In an investigation of perceived stress and coping in older women, Boland (1990) found a correlation of a similar magnitude ($r = -.66$) using the N scale from the NEO Personality Inventory (Costa & McCrae, 1985) to control for optimism (measured using the LOT). These significant correlations

between the measures of optimism and neuroticism lend support to the warning by Smith et al. (1989) that optimism as measured by the LOT may be confounded with neuroticism in the prediction of certain criterion variables. Optimism may, at least in part, represent the positive face of neuroticism. Research on the utility of optimism in predicting health-risk behaviour modification should continue to control for the confounding effects of neuroticism.

Psychological Distress

Contrary to our hypothesis, elevated levels of psychological distress, as measured by the BSI, did not predict membership in the Progressing vs. Non-progressing group across health-risk behaviours. Psychological distress did, however, contribute to the discriminant function in subjects attempting to modify diet and weight. This finding suggests that different psychological variables may be important in predicting change for different behaviours, even though social support was important across behaviours (i.e., following low-fat diet, adoption of exercise, weight-reduction & smoking cessation).

The direction of scores on the measure of psychological distress was not as anticipated. Progressing diet and weight subjects had higher BSI scores than those who failed to modify their diet or reduce their weight. These findings are not consistent with previous reports concerning behaviour change in general (c.f. Meichenbaum & Turk, 1987), and specifically with cardiac patients (Fielding,

1991; Fitzgerald, 1991). However two studies cited earlier concerning the role of psychological distress in behaviour change following acute cardiovascular disease (Blumenthal et al., 1982; Roviaro et al., 1984) pertained only to exercise. Given the low mean scores in psychological distress for our sample as a group, it is speculated that a minimal level of psychological distress may be necessary to motivate participants to change their diet and weight-reduction behaviour. Possibly the relationship between psychological distress and behaviour change is not linear, but an inverted U shape, which would explain different results from various studies. Because the sample size for our exploratory analyses was low it would be important to replicate this finding using a larger sample. More research needs to be carried out to investigate the contribution of psychological distress to modification of different behaviours.

Characteristics of Sample

The participants in this study were an inclusive sample of patients who had self-selected into a program designed to designed to assist them, and their partners, to adapt to living with heart disease. As such they do not represent a random sample of post-acute phase cardiac patients, and therefore the characteristics of these individuals must be taken into consideration when interpreting the results of the present study. For example, it must be considered that, since many of them had self-selected into a program of education and

support, they might have been particularly motivated towards behaviour change, and receptive to social support. This would explain why there were more successful changers than predicted based on the findings of Fitzgerald (1990). Further, the greater proportion of these subjects were married males who chose dietary fat reduction as their target behaviour. These specific characteristics limit the degree of generalizability of the findings from the study sample to cardiac patients in general, although our findings are relevant to those who enroll in rehabilitation programs.

Success in behaviour modification

In order to obtain an adequate number of Non-progressing subjects for the planned analyses, as many subjects as possible were recruited over and above the 110 subjects needed for statistical analysis based on the proportions obtained by Fitzgerald (1990). Nonetheless, the number of Non-progressors was lower than anticipated based on Fitzgerald (1990) where 36% of subjects failed to modify their chosen health-risk behaviour. The difference could be explained by the fact that the present subjects, having self-selected into, and received, a program of education and support, were particularly motivated towards behaviour change.

Treatment effects. The contribution of the *Heart to Heart* program to behavioural risk-factor reduction must not be overlooked. Numerous randomized controlled trials have been conducted to evaluate the effect of cardiac

rehabilitation programs on behavioural risk-factor reduction (Dracup et al., 1982; Gortner et al., 1988; Roman et al., 1983; Sivarajan et al., 1983; Vermeulen, Lie & Durrer, 1983). These researchers measured various combinations of risk-factors at different time -points in the recovery period. In general, however, when measured at less than one year after the cardiac event, success in behaviour modification ranged from 48% to 60%, although this number decreased as follow-up time increased to two or more years. In the present study successful change was achieved by 82% of subjects. An important methodological difference that must be considered is that the present study investigated *only the one most salient* risk-factor, whereas other studies measured several risk-factors simultaneously, and salience to the subject was not evaluated. Without the benefit of a randomized controlled design, we speculate that *Heart to Heart* is as effective as other programs in promoting risk-factor modification in the recovery period.

Self-report data. As was discussed in the methods section, the decision to measure self-reported change was based in part on conclusions drawn by other researchers regarding the accuracy of self-report measures. In their comprehensive review of the literature on the use of self-report versus biochemical validation Velicer et al. (1992) supported the view that self-reports of smoking cessation under almost all conditions leads to only 2% invalid

responses. These results are congruent with the findings of a meta-analysis evaluating studies comparing self-report data with confirmatory data (Patrick et al., 1994). In 1992 the U.S. Surgeon General's report supported the use of self-report data. We are confident that the present rate of self-reported behvaiour modification was related to the unique characteristics, discussed earlier, of our study sample.

Exploratory Analyses

Changes over time within the Progressing group

Few changes of clinical interest were detected over time within the group of progressing subjects. Analyses showed that the pros of change increased significantly over the seven months that participants were followed. Prochaska and DiClemente (1992) have reported that the pros of change remain high in the action and maintenance stages and gradually assume less importance as the new behaviour becomes firmly established. The increase found in the present study is congruent with newly established behaviour change. It is also likely that these individuals retained awareness of the importance of performing the new behaviour because as a result of their altered health status and their participation *in Heart to Heart*.

No differences were found across time on other Transtheoretical variables, cons of change, self-efficacy, or use of behavioural or experiential processes of

change. From the perspective of the Transtheoretical model, the lack of significant findings can be readily explained by the lack of movement across stages within the progressing group. For example, the majority of these subjects were in action or maintenance at all three data collection intervals (see Table 3). The number of subjects who moved from early to later stages was too small for analysis. In this respect, our data did not provide for a fair or robust test of how individuals progress through the Transtheoretical model stages of change following a coronary event.

Differences between Progressing and Non-progressing groups over time

Because only seventeen Non-progressing subjects responded at all three data collection points, it was not possible to compare Progressing and Non-progressing subjects over time on all of the anticipated variables. The lack of findings on the Transtheoretical variables was attributed to the aggregation of subjects in the maintenance and action stages, and the minimal shift across stages. In effect, a ceiling effect was attained.

Because of the aggregation of subjects in the action and maintenance stages, it was decided to compare Progressors and Non-progressors on psychological distress. No differences were detected over time as a function of membership in either the progressing or non-progressing group, suggesting that subjects who were unsuccessful at changing their behaviour did not differ in

levels of psychological distress from those who were successful. This is not consistent with the finding of Roviaro et al. (1984), but their study dealt only with participants trying to change their level of exercise.

The finding that psychological distress decreased over the study period (from before *Heart to Heart* to seven months later) is encouraging given reports that symptoms of depression are frequently found in cardiac patients one year after the cardiac event (Blumenthal & Emery, 1988; Cay & Walker, 1988; Langelddecke et al., 1989). It is possible that the *Heart to Heart* intervention had a significant treatment effect. At the same time, it is possible that enrollment bias into *Heart to Heart* eliminated more distressed individuals from this study. This is an issue that cannot be resolved without a randomized controlled design.

Strengths and Limitations of this Study

Study strengths

The present study was the first to investigate a number of variables in the context of risk-factor modification following acute cardiovascular disease. For example, it was the first to evaluate social intimacy as a predictor of behaviour change using a well-established measure of this construct, and the first to explore the role of optimism in behaviour change while simultaneously controlling for neuroticism. No other studies were found that focus specifically on the role of

neuroticism in risk-factor modification following acute coronary heart disease. In addition this study provides preliminary data on predictors of behaviour change for female as well as male cardiac patients. Until recently, studies of patients recovering from coronary heart disease have focused exclusively on male patients.

Study limitations

This study also has certain limitations. First, the findings from this study may be relevant only to patients who are motivated to change, and not to cardiac patients in general. The cardiac patients enrolled in this study may differ from recovering cardiac patients who do not seek such services as education and social support. As mentioned earlier, they may be more willing to change to a healthier lifestyle and more receptive to social support. Although the present findings can be generalized to patients who enroll in rehabilitation programs of education and support, they cannot be generalized to the population of post-acute cardiac patients at large. Future studies comparing patients who attend rehabilitation programs and those who do not will help fill in this gap in knowledge.

Despite our confidence in self-report data, it is possible that participants may have inflated their success in modifying their unhealthy behaviours, especially since this study was conducted with the Heart and Stroke Foundation.

Because this study employed a rather lengthy questionnaire, a social desirability rating was not included.

Finally, although preliminary data are available for female patients recovering from an acute cardiac event, women comprised only one quarter of the total sample, therefore findings based on the sample as a whole may not be generalizable to females.

Implications for clinical intervention and research

Clinical Intervention

The findings of this study highlight the importance of social support in the recovery of patients following acute cardiovascular disease, and are suggestive of interventions with cardiac rehabilitation patients. The present findings lend support to the format of psycho-educational rehabilitation groups for cardiac patients and their partners. Groups such as *Heart to Heart* provide couples with the opportunity to discover how other couples are experiencing, and coping with, the demands of cardiac disease.

Treatment strategies aimed at increasing the individual's sense of self-efficacy with regard to achieving and maintaining behaviour change may help patients to adhere to the changes in lifestyle required after heart disease. These strategies include provision of information, and sharing "how to" ideas, both of which are emphasized in *Heart to Heart*.

Future research

The findings of this study hold several implications for future research. First, the present findings should be replicated using a similar sample. The predicative value of social intimacy, and other measures of social support, should also be explored using a general sample of cardiac patients and not only those

who have enrolled in a program of education and support for patients and partners.

A considerable body of data has been accumulated to further our understanding of how people change. Research needs to focus on defining the characteristics of those individuals who fail to change health-risk behaviours, in and beyond the context of coronary disease. In particular, the findings of the present study highlight the importance of the social context of change. Future studies should design and evaluate interventions with individuals who have impoverished social networks, who are potentially at risk for failure to modify health-risk behaviours. It is possible that interventions, such as marital therapy, or support to lonely individuals will improve adherence to the medical regime, with the consequence of improved health and longevity for cardiac patients.

The value of optimism as a predictor of behaviour modification needs further investigation. However, future studies using the Life Orientation Test (LOT) for optimism should continue to control for the confounding effects of neuroticism.

Finally, with regard to further exploration and validation of the Transtheoretical model, longitudinal studies of change typologies need to be designed to capture the movement across stages of sufficient numbers of individuals for meaningful analyses. In addition, because the Transtheoretical

Model conceptualizes change as a circular (or rather spiral) process, future studies should explore participants past pattern of behaviour change.

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Appendix A
The Intervention: *Heart to Heart* Program

The *Heart to Heart* program was developed by the Heart and Stroke Foundation of Canada. It began in London, Ontario more than fifteen years ago, and became a program first of the Heart and Stroke Foundation of Ontario, and eventually of the Heart and Stroke Foundation of Canada in 1992. *Heart to Heart* is a program of education and support for individuals who have had a heart attack, cardiac surgery or angina. Through the program participants are able to increase their understanding of what has happened to them, and to enhance recovery by learning and using adaptive coping strategies to go on with their lives. Participants are usually accompanied by a partner, relative or close friend to help them consolidate what they learn and apply it to their lives. Within the group the support person also addresses his or her own concerns.

Heart to Heart is implemented in six provinces of Canada in a variety of communities, large and small, urban and rural. Given this diversity it would be unwise, if not impossible for *Heart to Heart* to be carried out in precisely the same way in every site. Specific guidelines are therefore provided for implementation of the program with suggestions for tailoring the program to meet the needs of individual communities. The goals and objectives of the program are described below, with an outline of the content and procedure of implementation.

Goals and Objectives

The World Health Organization has defined cardiac rehabilitation as the "sum of activity required to ensure cardiac patients the best possible physical, mental and social conditions so that they may by their own efforts regain as normal place as possible in the community and live an active life". From this broad definition, all of the activities that occur in hospital or as an out-patient can contribute to the ultimate rehabilitation result. The expanded definition of cardiac rehabilitation includes the concept of secondary prevention, which can be defined as efforts towards risk factor reduction designed to lessen the chance of a subsequent cardiac event and to slow and perhaps stop the progression of the disease process. The *Heart to Heart* program, through education, risk factor assessment and group support provides important components of the rehabilitation process. The objectives of the program include the following:

- to provide a knowledge base for understanding heart disease, its cause, diagnosis, treatment, recovery and rehabilitation process.
- to access the widest possible support base - personal, professional and community - for optimal functioning.
- to enhance problem-solving through sharing past experiences, personal significance, skills and strategies.
- to create a supportive environment in which these objectives may be realized.

Program Resources

As a primary resource, the Heart and Stroke Foundation of Canada is available for advise and tangible support to communities as they implement the program. Facilitators are trained by the Heart and Stroke Foundation, which also provides promotional materials, a detailed implementation guide, the eight-part video series and a course outline.

Overview of Program

The video series is built around the experiences of *Heart to Heart* alumni as they live through the after-effects of a cardiac event and work through a process of successful coping and adaptation. The video characters become extensions of the *Heart to Heart* group. Every week the video presents factual information in an understandable format in various topic areas including cardiology, nutrition, physical activity, smoking cessation, medications, emergency situations, and psychological aspects. In all sessions it is stressed that guidelines given are general, and individuals need to consult with their own physicians.

Session 1: Introduction and Welcome. In the first session group members introduce themselves and learn the purpose of *Heart to Heart*. They identify and share common interests and concerns with other participants, and identify personal goals to work towards in relation to the group and their rehabilitation.

Session 2: Meet Your Heart. Participants are taught about the functions of the heart and the underlying disease process of coronary heart disease, its symptoms and treatment. The importance of health-risk factor is addressed.

Session 3: Eat Smart. The role of nutrition as a risk factor in heart disease is discussed. Participants identify personal eating habits and practical ways of achieving change.

Session 4: On The Go. In this session the effects and benefits of physical activity on the heart are discussed. Participants are taught to assess their individual capabilities for physical activity and learn guidelines for resuming physical activity including sexual activity.

Session 5: Be prepared/Pill Talk. Participants discuss the importance of being able to recognize and respond appropriately to emergency situations. Practical tips are provided and the importance of developing emergency plans for work, home and cottage situations is stressed. The basic principles of cardio-pulmonary resuscitation are covered. Finally in this session cardiac medication is described, and a discussion is generated regarding side effects and the importance of taking medications accurately.

Session 6: Feeling Good/Feeling Bad. Heart disease is discussed in terms of its effect on lifestyles, self-concept, roles, responsibilities and family dynamics. The reactions of partners and family members are stressed and participants are

encouraged to accept the importance of identifying and acknowledging the feelings and behaviours that can occur in the context of heart disease.

Session 7: Stress. In this session the concept of stress is defined and its negative effects are explored in related to heart disease and recovery. Participants are taught to differentiate between distress and eustress, recognize personal symptoms of stress and identify effective coping strategies. The issue of group separation is introduced in preparation for the final session.

Session 8: Wind-up. In this final session the program is reviewed in relation to the needs and expectations of participants. Community resources are identified and participants are encouraged to express their feelings with regard to group separation, as well as to assess their future goals and continuing needs.

Appendix B
Comparison of Video-based and Speaker-based Groups

Prior to the introduction of the *Heart to Heart* video, *Heart to Heart* groups were conducted using guest speakers to deliver the educational content of the program. Heart and Stroke Foundation now encourages sites in Ontario to use the video-based format, although some sites prefer to continue to use speakers, often with videos as supplemental information or to fill in where speakers are unavailable. In addition, those sites that are video-based also use speakers at least once (usually for the diet component). When the present study was planned the intention was to recruit subjects from only video-based groups, but initial difficulty in recruiting subjects for this study prompted inclusion of subjects from both kinds of group format. Therefore, preliminary analyses were conducted to confirm that subjects did not differ on baseline demographic (gender, age, marital status, level of education and level of occupation), medical characteristics (type of cardiac event, time since cardiac event and perceived functional capacity) and choice of target behaviour. As with other preliminary analyses it was decided to relax control over Type 1 error, and the Bonferroni correction was not used. A combination of analysis of variance, Chi-square analyses and t-tests were conducted using with SPSSX for Windows.

Most important, it was found that the two group types did not differ by the outcome variable (i.e., changing health-risk behaviour). In addition the groups did not differ significantly in terms of demographic variables, perceived functional capacity or time since cardiac event. A statistically significant difference was detected, however, in type of cardiac event. *Heart to Heart* clients attending speaker-based groups were significantly more likely to have had cardiovascular by-pass surgery only (CABG) while those in video-based groups more likely had both CABC and AMI (χ^2 (2) = 7.56, p = .02). This difference was probably due to the fact that more speaker-based groups were attached to cardiac medical centres where post-surgical patients were referred to *Heart to Heart*. Because the groups did not differ in terms of the outcome variable, this difference was not considered to be a threat to the validity of this study. The data are presented in the table on the following page.

Descriptive Data and Significance Tests on Time 1 Demographic, Medical Factors and Choice of Target Behaviour for Video and Speaker Groups

		Video N = 105	Speaker N = 51	Statistic	Statistical Significance
Demographic	**Gender** *(percent)*				
	Males	68.4	65.8	χ^2 (1) = .07	NS
	Females	31.6	34.2		
	Age				
	Mean	57.7	54.1	t (153) = 1.81	NS
	Standard Deviation	10.3	14.3		
	Marital status *(percent)*				
	Single	6.7	2.0		
	Married/common law	81.9	84.0	χ^2 (3) – 1.63	NS
	Divorced/separated	6.7	8.0		
	Widowed	4.8	6.0		
	Level of Education *(percent)*				
	High School	64	77	χ^2 (1) = 2.55	NS
	Post High School	36	23		
Medical Factors					
	Time Since Event *(weeks)*				
	Mean	11.9	9.1	t (153) = 1.79	NS
	Standard Deviation	9.4	8.0		
	Cardiac Event *(per cent)*				
	AMI	79.0	76.0		
	CABG	5.7	18.0	χ^2 (2) = 7.56	p = .02
	AMI & CABG	15.2	6.0		
	Functional Capacity (DASI)				
	Mean	22.4	20.6	t (153) = .85	NS
	Standard Deviation	9.4	8.1		
Target Behaviour	*(per cent)*				
	Diet	50.5	36.7		
	Exercise	20.0	38.8	χ^2 (3) = 6.28	NS
	Weight	13.3	12.2		
	Smoking	16.2	12.2		

Appendix C

HEART to HEART
A Program for Cardiac Patients and Their Partners

STATEMENT OF INFORMED CONSENT

You are invited to participate in a study of people recovering from heart attack or heart surgery. We hope that this study will ultimately help health care workers and patients to develop the best possible strategies for improving recovery after acute heart conditions. It will also help us to evaluate "Heart to Heart". The study will be conducted by Dr. Rob Nolan, Coordinator of Health Psychology at Ottawa General Hospital and Alison Lee, Doctoral candidate at the University of Ottawa, in conjunction with Heart and Stroke Foundation of Ontario.

If you agree to participate, we will ask you to complete three questionnaire booklets. The first one should take approximately one hour to complete, and is to be returned at your first "Heart to Heart" meeting. The second should take less than half an hour to complete, and should be returned by mail in the postage-paid envelope we will provide, immediately after you finish this program. The third question booklet will be mailed to your home five months after the Heart to Heart program finishes, and you will be asked to return it, completed, in the postage-paid envelope provided by the Heart and Stroke Foundation. This should also take less than half an hour to complete. We may contact you by telephone to remind you to complete the forms and ask if you have any difficulties with the questions.

We will take all available safeguards to ensure that the information collected during this study will be held strictly confidential.

Your participation in this project is entirely voluntary, and you may withdraw at any time, even after signing this consent form. Furthermore, should you decline to participate in the study, this will in no way affect your experience in "Heart to Heart".

This protocol has been reviewed by the Research Ethics Board of the Ottawa General Hospital. This Board considers the ethical aspects of all hospital research projects using human subjects. If you wish, you may talk to the chairperson of the Research Ethics Board - Dr. G.D.Goss at 613-737-6792.

HEART AND STROKE FOUNDATION

INFORMED CONSENT

The purpose and the procedure of this research project have been explained to me, and I understand them. I agree to participate as a subject in this research project.

_____
Participant's Name

_____
Participant's Signature

_____
Date

* Any questions or comments regarding my participation in this study may be directed to **Alison Lee 1-800-797-0397** or Dr. Nolan 737-8628

Appendix D

Background Information Questionnaire

** *We would like you **FIRST** to answer this white booklet and then, **ONE** of the coloured booklets. The last question in this booklet will help you decide which coloured booklet to choose.*

INSTRUCTIONS: for each question below, please indicate your response by placing a check mark or writing your answer in the space provided

THE DATE TODAY IS:

___/ _____ / ___
Day Month Year

1. Are you: ( ) Male ( ) Female

2. What is you age? _____

3. What is your height (without shoes) _____ ft/in or cm

4. What is your weight? _____ lbs or kg

5. What is the highest level of education you have obtained?

( ) less than high school
( ) completed high school
( ) some post high school, but not certified etc.
( ) community college or CEGEP diploma or equivalent
( ) university degree

6. What is your occupation, or if retired, your former occupation?

_____

7. What is your marital status?
( ) single or never married
( ) married, including common law
( ) separated or divorced
( ) widowed

8. Check statement(s) which apply to you:

( ) I had a heart attack
( ) I had heart bypass surgery

9. Date of hospitalization due to above:
(If unsure, give approximate day)

From To

____/____/____ /____/____/____/
Day Month Year Day Month Year

Appendix E

Duke Activity Status Index

CAN YOU.....

1. Take care of yourself, that is, eating, dressing, bathing or using the toilet?	( ) ( ) Yes No
2. Walk outdoors, such as around your house?	( ) ( ) Yes No
3. Walk a block or 2 on ground level?	( ) ( ) Yes No
4. Climb a flight of stairs, or walk up a hill?	( ) ( ) Yes No
5. Run a short distance?	( ) ( ) Yes No
6. Do light work around the house like dusting or washing dishes?	( ) ( ) Yes No
7. Do moderate work around the house like vacuuming, sweeping floors or carrying in groceries?	( ) ( ) Yes No
8. Do heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	( ) ( ) Yes No
9. Do yardwork like raking leaves, weeding or pushing a power mower?	( ) ( ) Yes No
10. Have sexual relations?	( ) ( ) Yes No
11. Participate in moderate recreational activities like golf, bowling, or dancing, doubles tennis throwing a baseball or football ?	( ) ( ) Yes No
12. Participate in strenuous sports like swimming, singles tennis, football, basket ball or skiing?	( ) ( ) Yes No

Appendix F

Neuroticism Scale from NEO-FFI*

INSTRUCTIONS: This questionnaire consists of 24 questions. Read each statement carefully. For each statement circle the answer that best represents your opinion.

SD = Strongly Disagree
D = Disagree
N = Neutral
A = Agree
SA = Strongly Agree

1. I am not a worrier.	SD	D	N	SA	A
2. I often feel inferior to others	SD	D	N	SA	A
3. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.	SD	D	N	SA	A
4 I rarely feel lonely or blue.	SD	D	N	SA	A
5. I often feel tense and jittery.	SD	D	N	SA	A
6. Sometimes I feel completely worthless.	SD	D	N	SA	A
7. I rarely feel fearful or anxious.	SD	D	N	SA	A
8 I often get angry at the way people treat me.	SD	D	N	SA	A
9. Too often, when things go wrong, I get discouraged and feel like giving up.	SD	D	N	SA	A
10. I am seldom sad or depressed.	SD	D	N	SA	A
11. I often feel helpless and want someone else to solve my problems.	SD	D	N	SA	A
12. At times I have been so ashamed I have just wanted to hide.	SD	D	N	SA	A

Appendix G
Life Orientation Test

INSTRUCTIONS: Please indicate the extent to which you agree with the following items by circling the appropriate number beside each statement. Please be as accurate and honest as you can throughout, and try not to let your answer to one item influence your answer to another. There are no right or wrong answers

0 = Strongly Disagree (SD)
1 = Disagree (D)
2 = Neutral (N)
3 = Agree (A)
4 = Strongly Agree (SA)

	SD	D	N	A	SA
1 In uncertain times I usually expect the best	0	1	2	3	4
2 It's easy for me to relax	0	1	2	3	4
3 If something can go wrong for me it will	0	1	2	3	4
4 I always look on the bright side of things	0	1	2	3	4
5 I am always optimistic about my future	0	1	2	3	4
6 I enjoy my friends a lot	0	1	2	3	4
7 It's important for me to keep busy	0	1	2	3	4
8 I hardly ever expect things to go my way	0	1	2	3	4
9 Things never work out the way I want them to	0	1	2	3	4
10 I don't get upset too easily	0	1	2	3	4
11 I'm a believer in the idea that "every cloud has a silver lining"	0	1	2	3	4
12 I rarely count on good things happening to me	0	1	2	3	4

Brief Symptom Inventory Appendix H 128-129

Appendix I
Miller Social Intimacy Scale

INSTRUCTIONS: Please think of someone special in your life (e.g., spouse , partner or close friend). Answer each question in relation to that special person. For each question circle the number that best describes how you feel.

	Almost									
1. When you have leisure time how often do you choose to spend it with him/her alone?	1	2	3	4	5	6	7	8	9	10
2 How often do you keep very personal information to yourself and not share it with him/her?	1	2	3	4	5	6	7	8	9	10
3 How often do you show him/her affection?	1	2	3	4	5	6	7	8	9	10
4 How often do you confide very personal information to him/her?	1	2	3	4	5	6	7	8	9	10
5 How often are you able to understand his/her feelings?	1	2	3	4	5	6	7	8	9	10
6 How often do you feel close to him/her	1	2	3	4	5	6	7	8	9	10

	Not Much			**A Little**					**A Great Deal**	
7 How much do you like to spend time with him/her alone?	1	2	3	4	5	6	7	8	9	10
8 How much do you feel like being encouraging and supportive to him/her when he/she is unhappy?	1	2	3	4	5	6	7	8	9	10
9 How close do you feel to him/her most of the time?	1	2	3	4	5	6	7	8	9	10
10 How important is it to listen to his/her very personal disclosures?	1	2	3	4	5	6	7	8	9	10
11 How satisfying is your relationship with him/her?	1	2	3	4	5	6	7	8	9	10

Continues over page

MSIS ***(Continued)***

	Not Much				A Little					A Great Deal
12 How affectionate do you feel towards him/her?	1	2	3	4	5	6	7	8	9	10
13 How important is it to you that he/she understands your feelings?	1	2	3	4	5	6	7	8	9	10
14 How much damage is caused by a typical disagreement in your relationship with him/her?	1	2	3	4	5	6	7	8	9	10
15 How important is it to you that he/she be encouraging to you when you are unhappy?	1	2	3	4	5	6	7	8	9	10
16 How important is it to you that he/she show you affection?	1	2	3	4	5	6	7	8	9	10
17 How important is your relationship with him/her in your life?	1	2	3	4	5	6	7	8	9	10

Appendix J
Staging Algorithms for Diet, Weight, Exercise and Smoking

INSTRUCTIONS: Please read the following questions and all the possible answers carefully. Choose the best response for each question by placing a check mark in the appropriate box.

1: Diet

Do you consistently avoid eating high fat foods?

- ☐ YES, I have been for MORE than 6 months
- ☐ YES, I have been, but for LESS than 6 months
- ☐ NO, but I intend to in the next 30 days
- ☐ NO, but I intend to in the next 6 months
- ☐ NO, and I do not intend to in the next 6 months.

2: Weight

Have you been trying to lose weight?

- ☐ Never been overweight (skip question 2)

- ☐ YES, I have been for MORE than 6 months
- ☐ YES, I have been, but for LESS than 6 months
- ☐ NO, but I intend to in the next 30 days
- ☐ NO, but I intend to in the next 6 months
- ☐ NO, and I do not intend to in the next 6 months

3: Exercise

REGULAR EXERCISE = AT LEAST 20 MINUTES AT LEAST 3 TIMES PER WEEK

Do you exercise regularly?

- ☐ YES, I have been for MORE than 6 months
- ☐ YES, I have been, but for LESS than 6 months
- ☐ I exercise some but not regularly
- ☐ NO, but I intend to in the next 6 months
- ☐ NO, and I do not intend to in the next 6 months

4, Smoking

Have you quit smoking cigarettes?

- ☐ Never smoked, or quit for at least 5 years (skip question 5)

- ☐ YES, I have for MORE than 6 months
- ☐ YES, I have, but for LESS than 6 months
- ☐ NO, but I intend to in the next 30 days
- ☐ NO, but I intend to in the next 6 months
- ☐ NO, and I do not intend to in the next 6 months

You have just answered questions related to 4 problem behaviours that are associated with increased likelihood of further heart disease. These behaviours are:

DIET	**(eating high fat foods)**
WEIGHT	**(not maintaining an ideal body weight)**
EXERCISE	**(not exercising at least three times a week for at least 20 minutes each time)**
SMOKING	**(smoking cigarettes)**

As you answer question 8, please think about these 4 behaviours.....

8. Now that you have had heart problems, which of these behaviours do you most need to change?
(Please write the answer in space below:)

_____

End of first question booklet

Now we would like you to answer one of the coloured question booklets. The colour you choose depends on your answer to question 8

If you answered "EXERCISE" please fill out the GREEN booklet
If you answered "DIET" please fill out the YELLOW booklet
If you answered "WEIGHT" please fill out the BLUE booklet
If you answered "SMOKING" please fill out the PINK booklet

Appendix K

Transtheoretical Model Questionnaires for Diet Modification

You indicated that FOLLOWING A LOW FAT DIET is the behaviour you most need to change. Please answer these remaining questions on DIETARY FAT:

Impacts on Diet (Processes of Change)

INSTRUCTIONS: The following experiences can affect the diet of some people. Think of any similar experience you may have had in trying to follow a low-fat diet.. Please rate how FREQUENTLY you have used each of these during the past month on a 5 point scale with 1= repeatedly and 5 = Never

1 = Repeatedly
2 = Often
3 = Occasionally
4 = Seldom
5 = Never

	1	2	3	4	5
1. I look for information on how to reduce the amount of fat in my diet.	☐	☐	☐	☐	☐
2. When I am tempted to eat a food high in fat, I try to distract myself by doing something else .	☐	☐	☐	☐	☐
3. Warnings about the health hazards associated with eating too much fat upset me.	☐	☐	☐	☐	☐
4. I think about the idea that society would be healthier if more people decreased the amount of fat they ate.	☐	☐	☐	☐	☐
5. I have someone I can rely on to support my decision to develop healthier eating practices.	☐	☐	☐	☐	☐
6. I have given up eating meals with people who mainly eat foods high in fat.	☐	☐	☐	☐	☐
7. Other people in my life try to make me feel good when I don't eat foods high in fat.	☐	☐	☐	☐	☐
8. I make commitments not to eat high fat foods.	☐	☐	☐	☐	☐
9. I feel good about myself when I limit the amount of fat in my diet..	☐	☐	☐	☐	☐
10. I notice that supermarkets are making it easier for consumers to buy foods low in fat..	☐	☐	☐	☐	☐

Continues over page

IMPACTS ON DIET (Continued)

	Rep 1	Oft 2	Occ 3	Sel 4	Nev 5
11. I remove the high fat foods from my home that I know I am tempted to eat..	☐	☐	☐	☐	☐
12. I think about information on how to limit the amount of fat in my diet.	☐	☐	☐	☐	☐
13. I find that keeping myself busy helps me to avoid eating a favourite high fat food.	☐	☐	☐	☐	☐
14 Television programs about people who have diseases that are related to eating a diet high in fat upset me	☐	☐	☐	☐	☐
15. I think the world would be a better place if more people limited the amount of fat they consumed.	☐	☐	☐	☐	☐
16. I have someone I can count on when I am having a problem with decreasing the amount of fat in my diet.	☐	☐	☐	☐	☐
17. I avoid social situations which might tempt me to eat meals which are high in fat.	☐	☐	☐	☐	☐
18. I expect to be praised by others if I cut down on the amount of fat I eat.	☐	☐	☐	☐	☐
19. I make commitments to reduce the amount of fat in my diet.	☐	☐	☐	☐	☐
20. I avoid situations in which I might be tempted to eat high fat foods	☐	☐	☐	☐	☐
21. I find society changing in ways that make it easier to reduce the amount of fat in my diet.	☐	☐	☐	☐	☐
22. I don't keep foods that are high in fat in my home.	☐	☐	☐	☐	☐
23. I consider articles and other information I have seen about decreasing the amount of fat in the diet.	☐	☐	☐	☐	☐
24. I find it helpful to engage in some physical activity to keep from eating a favourite high fat food.	☐	☐	☐	☐	☐

Continues on next page

IMPACTS ON DIET (Continued)

	Rep 1	Oft 2	Occ 3	Sel 4	Nev 5
25 Remembering research about illnesses associated with eating too much fat upsets me.	☐	☐	☐	☐	☐
26. I consider the notion that society's health care costs would be less if everyone decreased the amount of fat they ate.	☐	☐	☐	☐	☐
27. I have someone who listens when I need to talk about changing what I eat.	☐	☐	☐	☐	☐
28..I find there is a trend in society nowadays for people to reduce the amount of fat they eat.	☐	☐	☐	☐	☐
29. Other people will be pleased if I reduce the amount of fat I consume.	☐	☐	☐	☐	☐
30. I consider that feeling content with myself includes changing the amount of fat in my diet.	☐	☐	☐	☐	☐
31. I avoid eating with other people who may encourage me to to eat high fat foods.	☐	☐	☐	☐	☐

PROS AND CONS

Each statement represents a thought that might occur to a person who is deciding whether or not to follow a low fat diet. Please indicate how IMPORTANT each of these statements might be to you if you were considering a decision to change your diet. There are FIVE possible responses to each of the items that reflect your answer to the question "How important would this be to you?" Please check the box that best describes how important each statement would be to you if you were deciding whether or not to lose weight

5 = Extremely important
4 = Very important
3 = Moderately important
2 = Slightly important
1 = Not important at all

	Rep 1	Oft 2	Occ 3	Sel 4	Nev 5
1. Because I continue to eat foods high in fat, some people I know think I am neglecting my health.	☐	☐	☐	☐	☐
2. People close to me disapprove of my eating a diet which is too high in fat.	☐	☐	☐	☐	☐
3. Other people are bothered by my having a diet which is too high in fat.	☐	☐	☐	☐	☐
4. People think I'm foolish for ignoring the warnings about eating foods that are too high in fat.	☐	☐	☐	☐	☐
5. I am relaxed and therefore more pleasant to be with when free to eat foods high in fat.	☐	☐	☐	☐	☐
6. Consuming my favourite high fat foods is a quick way to satisfy my hunger.	☐	☐	☐	☐	☐
7. My family and friends like me better when I am happily eating foods high in fat than when I am miserably trying to give them up	☐	☐	☐	☐	☐
8. I am more content with myself when I am eating the high fat foods I enjoy.	☐	☐	☐	☐	☐

CONFIDENCE

The next statements describe some typical eating situations. Everyone has situations which make it very hard for them to follow a low fat diet. The following are a number of situations relating to eating patterns and attitudes. Read each situation and decide how confident (or certain) you are that you will be able to resist eating high fat foods in each of the difficult situations. In other words, pretend that you are in the eating situation right now. On a scale from 1 (not confident) to 5 (very confident) choose ONE number that best reflects how confident you feel about being able to successfully resist the desire to eat high fat foods. Write this number down next to each item.

Not confident at all that you can resist high fat foods — *Very confident that you can resist high fat foods*

1 2 3 4 5

EXAMPLES:
I AM CONFIDENT THAT:

	CONFIDENCE NUMBER
1. I can control my eating on weekends	4
2. I can say "No" to snacks	2

I AM CONFIDENT I CAN RESIST EATING HIGH FAT FOOD:

	ONFIDENCE NUMBER
1. During those times I find myself depressed about something	
2. When I have experienced a tough day and am not feeling good about myself	
3. On days when things are not going my way and I feel frustrated	
4. When I have an argument with someone close to me and I feel upset.	
5. While having a good time with friends at a party.	
6. While eating out at a restaurant with close friends.	
7. In situations in which I am celebrating with friends and feel happy.	
8. While enjoying the company of others at a picnic or barbecue.	
9. I n situations where eating a low fat food is just too much trouble.	

continues on next page

CONFIDENCE (Continued)

Not confident at all that you can resist high fat foods — *Very confident that you can resist high fat foods*

1 *2* *3* *4* *5*

I AM CONFIDENT I CAN RESIST EATING HIGH FAT FOOD:

	CONFIDENCE NUMBER
10. When substituting a low fat food for the high one I want to eat is a problem.	_____
11. When it would be very difficult to substitute a low fat food because only high fat ones are available.	_____
12. When I have to prepare meals for myself that are not high in fat.	_____

End of Question Booklet

Thank you very much for answering these questions for us !
Please return them right away in your postage-paid envelope!

The next question booklet will be sent to you after Heart to Heart finishes and will only take you approximately 30 minutes to answe

Appendix L

Transtheoretical Model Questionnaires for Exercise Modification

You indicated that EXERCISE is the behaviour you most need to change.
Please answer these remaining questions on exercise:

Impacts on Exercise

The following experiences can affect the physical activity of some people. Think of any similar experience you may be currently having, or have had in the last month. Then write the frequency of each event on a 5 point scale with 1 = repeatedly and 5 = Never.

1 = Repeatedly
2 = Often
3 = Occasionally
4 = Seldom
5 = Never

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
1 I recall information people have personally given me on the benefits of exercise.	☐	☐	☐	☐	☐
2. Warnings about the hazards of inactivity move me emotionally	☐	☐	☐	☐	☐
3. I feel I would be a better role model for others if I exercised regularly.	☐	☐	☐	☐	☐
4. I am considering the idea that regular exercise would make me a healthier, happier person to be around.	☐	☐	☐	☐	☐
5. I find society changing in ways that make it easier for the exerciser.	☐	☐	☐	☐	☐
6. Instead of remaining inactive, I engage in some physical activity	☐	☐	☐	☐	☐
7. I have someone on whom I can depend when I am having problems with exercising.	☐	☐	☐	☐	☐
8. I reward myself when I exercise.	☐	☐	☐	☐	☐
9. I tell myself I am able to keep exercising if I want to.	☐	☐	☐	☐	☐
10..I put things around my home to remind me of exercising.	☐	☐	☐	☐	☐

Continues over page

Impacts on Exercise (Continued)

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
11. I think about information from articles and advertisements on how to make exercise a regular part of my life.	☐	☐	☐	☐	☐
12. Dramatic portrayals of the evils of inactivity move me emotionally.	☐	☐	☐	☐	☐
13. I wonder how my inactivity affects those people who are close to me.	☐	☐	☐	☐	☐
14. I think about the type of person I will be if I keep exercising.	☐	☐	☐	☐	☐
15. I am aware of more and more people encouraging me to exercise these days.	☐	☐	☐	☐	☐
16. Rather than viewing exercise as simply another task to get out of the way, I try to use it as my special time to relax and recover from the day's worries.	☐	☐	☐	☐	☐
17. I have a healthy friend who encourages me to exercise when I don't feel up to it.	☐	☐	☐	☐	☐
18. I try to set realistic goals for myself rather than setting myself up for failure by expecting too much.	☐	☐	☐	☐	☐
19. I tell myself that if I try hard enough I can keep exercising.	☐	☐	☐	☐	☐
20. I keep things around my place of work that remind me of exercise	☐	☐	☐	☐	☐
21. I read articles about exercise in an attempt to learn more. about it	☐	☐	☐	☐	☐
22. I react emotionally to warnings about an inactive lifestyle.	☐	☐	☐	☐	☐
23. I realize that I might be able to influence others to be healthier if I would exercise more.	☐	☐	☐	☐	☐
24. I get frustrated with myself when I don't exercise.	☐	☐	☐	☐	☐

Continues on next page

Impacts on Exercise (Continued)

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
25. I notice that more businesses are encouraging their employees to exercise by offering fitness courses and time off to work out.	☐	☐	☐	☐	☐
26. When I feel tired, I make myself exercise anyway because I know I will feel better afterward.	☐	☐	☐	☐	☐
27. I have someone who points out my rationalizations for not exercising.	☐	☐	☐	☐	☐
28. When I exercise, I tell myself that I am being good to myself by taking care of my body.	☐	☐	☐	☐	☐
29. I make commitments to exercise.	☐	☐	☐	☐	☐
30. I remove things that contribute to my inactivity.	☐	☐	☐	☐	☐
31. I look for information related to exercise.	☐	☐	☐	☐	☐
32. Some of my close friends might exercise more if I would.	☐	☐	☐	☐	☐
33. I consider the fact that I would feel more confident if I exercised regularly.	☐	☐	☐	☐	☐
34. I am aware that many health clubs now provide free baby-sitting services to their members	☐	☐	☐	☐	☐
35. When I'm feeling tense, I find exercise a great way to relieve my worries.	☐	☐	☐	☐	☐
36. I have someone who provides feedback about my exercising.	☐	☐	☐	☐	☐
37. I do something nice for myself for making efforts to exercise more.	☐	☐	☐	☐	☐
38. I remind myself that I am the only one who is responsible for my health and well-being, and that only I can decide whether or not I will exercise.	☐	☐	☐	☐	☐
39. I avoid spending long periods of time in environments that promote inactivity.	☐	☐	☐	☐	☐

PROS AND CONS

The following statements represent different opinions about exercise. Please rate HOW IMPORTANT each statement is to you according to the following 5 point scale with 5 = Extremely important and 1 = Not important

5 = Extremely important
4 = Very important
3 = Moderately important
2 = Slightly important
1 = Not important

	Not Imp. 1	Slight. Imp. 2	Mod. Imp. 3	Very Imp. 4	Extreme. Imp. 5
1. I would have more energy for my family and friends if I exercised regularly.	☐	☐	☐	☐	☐
2. I think I would be too tired to do my daily work after exercising.	☐	☐	☐	☐	☐
3. Regular exercise would help me relieve tension.	☐	☐	☐	☐	☐
4. I would find it difficult to find an exercise activity that I enjoy that is not affected by bad weather.	☐	☐	☐	☐	☐
5. I would feel more confident if I exercised regularly.	☐	☐	☐	☐	☐
6. I feel uncomfortable when I exercise because I get out of breath and my heart beats very fast.	☐	☐	☐	☐	☐
7. I would sleep more soundly if I exercised regularly.	☐	☐	☐	☐	☐
8. Regular exercise would take too much of my time.	☐	☐	☐	☐	☐
9. I would feel good about myself if I kept my commitment to exercise regularly.	☐	☐	☐	☐	☐
10. I would have less time for my family and friends if I exercised regularly.	☐	☐	☐	☐	☐
11. I would like my body better if I exercised regularly.	☐	☐	☐	☐	☐

Continues on next page

PROS AND CONS (Continued)

	Not Imp.	Slight. Imp.	Mod. Imp.	Very Imp.	Extreme. Imp.
		1	2	3	4	5
12. At the end of the day I am too exhausted to exercise regularly	☐	☐	☐	☐	☐
13. It would be easier for me to perform routine physical. tasks if I exercised regularly.	☐	☐	☐	☐	☐
14. I would feel less stressed if I exercised regularly.	☐	☐	☐	☐	☐
15. I would feel more comfortable with my body if I exercised regularly.	☐	☐	☐	☐	☐
16. Regular exercise would help me have a more positive outlook on life.	☐	☐	☐	☐	☐

Please complete other side of this page

EXERCISE SITUATIONS - CONFIDENCE

INSTRUCTIONS: Listed below are situations that lead some people avoid regular exercise. We would like to know how confident you are that you would exercise in these situations. Please answer the following questions by using a 5 point scale with 5 = Extremely Confident and 1 = Not at all Confident

5 = Extremely confident
4 = Very confident
3 = Moderately confident
2 = Not very confident
1 = Not at all confident

I am confident I would participate in regular exercise when:

	Not at all. 1	Not very 2	Mod. 3	Very 4	Extreme. 5
1. I am tired	☐	☐	☐	☐	☐
2. I am in a bad mood.	☐	☐	☐	☐	☐
3. I feel I don't have the time	☐	☐	☐	☐	☐
4. I am on vacation	☐	☐	☐	☐	☐
5. It is raining or snowing.	☐	☐	☐	☐	☐

End of question booklet

Thank you very much for answering these questions for us !
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Appendix M

Transtheoretical Measures for Smoking

You indicated that SMOKING is the behaviour you most need to change.
Please answer these remaining questions on smoking:

Impacts on smoking

The following experiences can affect the smoking pattern of some people. Think of any similar experience you may be currently having, or have had in the last month. Then write the frequency of each event on a 5 point scale with 1 = repeatedly and 5 = Never.

1 = Repeatedly
2 = Often
3 = Occasionally
4 = Seldom
5 = Never

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
1. Special people in my life accept me the same whether I smoke or not	☐	☐	☐	☐	☐
2. I see "No Smoking" signs in public buildings	☐	☐	☐	☐	☐
3. I can be open with at least one special person about my experience with smoking	☐	☐	☐	☐	☐
4. I tell myself I can choose to smoke or not	☐	☐	☐	☐	☐
5. Instead of smoking I engage in some physical activity	☐	☐	☐	☐	☐
6. I recall articles dealing with the problems of quitting smoking	☐	☐	☐	☐	☐
7. I notice that public places have sections set aside for smokers	☐	☐	☐	☐	☐
8. I recall information people have personally given me on the benefits of quitting smoking	☐	☐	☐	☐	☐
9. I am considering the belief that people quitting smoking would help improve the world	☐	☐	☐	☐	☐
10. I think about information from articles and advertisements on how to stop smoking.	☐	☐	☐	☐	☐
11. Remembering studies about illnesses caused by smoking upsets me.	☐	☐	☐	☐	☐

Impacts on Smoking (Continued)

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
12. Other people in my daily life try to make me feel good when I don't smoke	☐	☐	☐	☐	☐
13. I tell myself I am able to quit if I want to	☐	☐	☐	☐	☐
14. I have someone who listens when I need to talk about my smoking	☐	☐	☐	☐	☐
15. I remove things from my home that remind me of smoking.	☐	☐	☐	☐	☐
16. I tell myself that if I try hard enough I can keep from smoking.	☐	☐	☐	☐	☐
17. I recall information people have personally given me on how to quit smoking.	☐	☐	☐	☐	☐
18. I make commitments not to smoke.	☐	☐	☐	☐	☐
19. I reward myself when I don't smoke.	☐	☐	☐	☐	☐
20. I notice that nonsmokers are asserting their rights.	☐	☐	☐	☐	☐
21. I stop to think that smoking is polluting the environment.	☐	☐	☐	☐	☐
22. I can expect to be rewarded by others if I don't smoke	☐	☐	☐	☐	☐
23. I keep things around my place of work that remind me not to smoke	☐	☐	☐	☐	☐
24. I find society changing in ways that make it easier for the nonsmoker	☐	☐	☐	☐	☐
25. I get upset when I think about my smoking.	☐	☐	☐	☐	☐

Impacts on Smoking (Continued)

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
26. I find that doing other things with my hands is a good substitute for smoking.	☐	☐	☐	☐	☐
27. When I am tempted to smoke, I think about something else.	☐	☐	☐	☐	☐
28. I do something else instead of smoking when I need to relax or deal with tension.	☐	☐	☐	☐	☐
29. I remove things from my place of work that remind me of smoking.	☐	☐	☐	☐	☐
30. Warnings about the health hazards of smoking move me emotionally.	☐	☐	☐	☐	☐
31. Dramatic portrayals of the evils of smoking affect me emotionally.	☐	☐	☐	☐	☐
32. I react emotionally to warnings about smoking cigarettes	☐	☐	☐	☐	☐
33. I am rewarded by others if I don't smoke.	☐	☐	☐	☐	☐
34. I consider the view that smoking can be harmful to the environment.	☐	☐	☐	☐	☐
35. I reassess the fact that being content with myself includes changing the smoking habit.	☐	☐	☐	☐	☐
36. I consciously struggle with the issue that smoking contradicts my view of myself as a caring and responsible person	☐	☐	☐	☐	☐
37. I put things around my home that remind me not to smoke.	☐	☐	☐	☐	☐
38. My dependency on cigarettes makes me feel disappointed in myself.	☐	☐	☐	☐	☐
39. I am considering the idea that the world around me would be a better place without my smoking.	☐	☐	☐	☐	☐
40. I have someone on whom I can count when I am having problems with my smoking.	☐	☐	☐	☐	☐

PROS AND CONS

The following statements represent different opinions about smoking. Please rate HOW IMPORTANT each statement is to you according to the following 5 point scale with 5 = Extremely important and 1 = Not important

5 = Extremely important
4 = Very important
3 = Moderately important
2 = Slightly important
1 = Not important

	Not Imp. 1	Slight. Imp. 2	Mod. Imp. 3	Very Imp. 4	Extreme. Imp. 5
1. Smoking cigarettes is pleasurable	☐	☐	☐	☐	☐
2. My smoking affects the health of others.	☐	☐	☐	☐	☐
3. I like the image of a cigarette smoker.	☐	☐	☐	☐	☐
4. Others close to me would suffer if I became ill from smoking.	☐	☐	☐	☐	☐
5. I am relaxed and therefore more pleasant when smoking.	☐	☐	☐	☐	☐
6. Because I continue to smoke, some people think I lack the character to quit.	☐	☐	☐	☐	☐
7. I f I try to stop smoking I'll be irritable and a pain to be around.	☐	☐	☐	☐	☐
8. Smoking cigarettes is hazardous to my health	☐	☐	☐	☐	☐
9. My family and friends like me better when I am happily smoking than when I'm miserably trying to quit.	☐	☐	☐	☐	☐
10. I'm embarrassed to have to smoke	☐	☐	☐	☐	☐
11. I like myself better when I smoke	☐	☐	☐	☐	☐
12. My cigarette smoking bothers other people	☐	☐	☐	☐	☐

Continues on next page

PROS AND CONS (Continued)

	NotImp. 1	Slight. Imp. 2	Mod. Imp. 3	Very Imp. 4	Extreme. Imp. 5
13. Smoking helps me concentrate and do better work.	☐	☐	☐	☐	☐
14. People think I'm foolish for ignoring the warnings	☐	☐	☐	☐	☐
15. Smoking cigarettes relieves tension.	☐	☐	☐	☐	☐
16. People close to me disapprove of my smoking.	☐	☐	☐	☐	☐
17. By continuing to smoke I feel like I am making my own decisions.	☐	☐	☐	☐	☐
18. I'm foolish to ignore the warnings about cigarettes	☐	☐	☐	☐	☐
19. After not smoking for a while a cigarette makes me feel great.	☐	☐	☐	☐	☐
20. I would be more energetic right now if I didn't smoke.	☐	☐	☐	☐	☐

SMOKING SITUATIONS - CONFIDENCE

INSTRUCTIONS: Listed below are situations that lead some people to smoke. We would like to know how confident you are that you would not smoke in these situations. Please answer the following questions by using a 5 point scale with 5 = Extremely Confident and 1 = Not at all Confident

5 = Extremely confident
4 = Very confident
3 = Moderately confident
2 = Not very confident
1 = Not at all confident

HOW CONFIDENT ARE YOU THAT YOU WOULD NOT SMOKE IN THIS SITUATION?

	Not at all. 1	Not very 2	Mod. 3	Very 4	Extreme. 5
1. At a bar or cocktail lounge having a drink?	☐	☐	☐	☐	☐
2. When I am desiring a cigarette	☐	☐	☐	☐	☐
3. When things are just not going the way I want and I am frustrated	☐	☐	☐	☐	☐
4. With my spouse or close friend who is smoking	☐	☐	☐	☐	☐
5. When there are arguments and conflicts with my family	☐	☐	☐	☐	☐
6. When I am happy and celebrating	☐	☐	☐	☐	☐
7. When I am very angry about something or someone	☐	☐	☐	☐	☐
8. When I would experience an emotional crisis such as an accident or death in the family	☐	☐	☐	☐	☐
9. When I see someone smoking and enjoying it	☐	☐	☐	☐	☐
10. Over coffee while talking and relaxing	☐	☐	☐	☐	☐

Continues on next page

HOW CONFIDENT ARE YOU THAT YOU WOULD NOT SMOKE IN THIS SITUATION?

	Not at all. 1	Not very 2	Mod. 3	Very 4	Extreme. 5
11. When I realize that quitting smoking is an extremely difficult task for me.	☐	☐	☐	☐	☐
12 When I am craving a cigarette.	☐	☐	☐	☐	☐
13. When I first get up in the morning	☐	☐	☐	☐	☐
14. When I fell I need a lift	☐	☐	☐	☐	☐
15. When I begin to let down on my concen about my health and am less physically active.	☐	☐	☐	☐	☐
16. With friends at a party	☐	☐	☐	☐	☐
17. When I wake up in the morning and face a rough day	☐	☐	☐	☐	☐
18. When I am extremely depressed.	☐	☐	☐	☐	☐
19. When I am extremely anxious and stressed.	☐	☐	☐	☐	☐
20. When I realize I haven't smoked for a while.	☐	☐	☐	☐	☐

Thank you very much for answering these questions for us !
Please return them right away in your postage-paid envelope!

The next question booklet will be sent to you after Heart to Heart finishes and will only take you approximately 30 minutes to answer

Appendix N

Transtheoretical Measures for Weight Reduction

You indicated that NOT MAINTAINING AN IDEAL BODY WEIGHT is the behaviour you most need to change. Please answer these remaining questions on weight:

Impacts on Weight

INSTRUCTIONS: The following experiences can affect the weight of some people. Think of any similar experience you may have had in trying to lose weight or keep from gaining weight.. Please rate how FREQUENTLY you have used each of these during the past month on a 5 point scale with 1 = repeatedly and 5= Never

1 = Repeatedly
2 = Often
3 = Occasionally
4 = Seldom
5 = Never

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
1. I read about people who have successfully lost weight.	☐	☐	☐	☐	☐
2. Instead of eating I engage in some physical activity	☐	☐	☐	☐	☐
3. Warnings about the health hazards of being overweight move me emotionally	☐	☐	☐	☐	☐
4. I consider the belief that people who lose weight will help to improve the world.	☐	☐	☐	☐	☐
5. I can be open with at least one special person about my experience with overeating behaviour.	☐	☐	☐	☐	☐
6. I leave places where people are eating a lot.	☐	☐	☐	☐	☐
7. I am rewarded by others when I lose weight.	☐	☐	☐	☐	☐
8. I tell myself I can choose to overeat or not.	☐	☐	☐	☐	☐
9. My dependency on food makes me feel disappointed in myself.	☐	☐	☐	☐	☐
10. I am the object of discrimination because of my being overweight.	☐	☐	☐	☐	☐

IMPACTS ON WEIGHT (Continued)

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
11. I remove things from my place of work that remind me of eating.	☐	☐	☐	☐	☐
12. I take some type of medication to help me control my weight.	☐	☐	☐	☐	☐
13. I think about information from articles or ads concerning the benefits of losing weight.	☐	☐	☐	☐	☐
14. I find that doing other things with my hands is a good substitute for eating.	☐	☐	☐	☐	☐
15. Dramatic portrayals of the problems of overweight people affect me emotionally..	☐	☐	☐	☐	☐
16. I stop to think that \overeating is taking more than my share of the world's food supply.	☐	☐	☐	☐	☐
17. I have someone who listens when I need to talk about my losing weight.	☐	☐	☐	☐	☐
18. I change personal relationships which contribute to my overeating.	☐	☐	☐	☐	☐
19. I expect to be rewarded by others when I don't overeat.	☐	☐	☐	☐	☐
20. I tell myself that I am able to lose weight if I want to.	☐	☐	☐	☐	☐
21. I get upset when I think about my overeating.	☐	☐	☐	☐	☐
22. I notice that overweight people have a hard time buying attractive clothes.	☐	☐	☐	☐	☐
23. I keep things around my place of work that remind me not to eat.	☐	☐	☐	☐	☐
24. I use diet aids to help me lose weight.	☐	☐	☐	☐	☐
25. I think about information from articles and advertisements on how to lose weight.	☐	☐	☐	☐	☐

IMPACTS ON WEIGHT (Continued)

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
26. When I am tempted to eat I think about something else	☐	☐	☐	☐	☐
27.I react emotionally to warnings about gaining too much weight.	☐	☐	☐	☐	☐
28. I consider the view that overeating can be harmful to the environment.	☐	☐	☐	☐	☐
29. I have someone whom I can count on when I am having problems with overeating.	☐	☐	☐	☐	☐
30. I relate less often to people who contribute to my overeating	☐	☐	☐	☐	☐
31. I reward myself when I do not overeat.	☐	☐	☐	☐	☐
32. I tell myself that if I try hard enough I can keep from overeating.	☐	☐	☐	☐	☐
33. I reassess the fact that being content with myself includes **changing my overeating.**	☐	☐	☐	☐	☐
34. I find society more supportive of thin people.	☐	☐	☐	☐	☐
35. I put things around my home that remind me not to overeat	☐	☐	☐	☐	☐
36. I take drugs to help me control my weight.	☐	☐	☐	☐	☐
37. I recall information people have personally given me on how to lose weight.	☐	☐	☐	☐	☐
38. I do something else instead of eating when I need to relax or deal with tension.	☐	☐	☐	☐	☐
39. Remembering studies about illnesses caused by being overweight upsets me.	☐	☐	☐	☐	☐
40. I consider the idea that overeating could be harmful to world food supplies.	☐	☐	☐	☐	☐

IMPACTS ON WEIGHT (Continued)

	Rep 1	Oft. 2	Occ. 3	Sel. 4	Never 5
41. I have someone who understands my problems with eating.	☐	☐	☐	☐	☐
42. I ask people not to overeat in my presence.	☐	☐	☐	☐	☐
43. Other people in my daily life try to make me feel good when I do not overeat.	☐	☐	☐	☐	☐
44. I make commitments to lose weight.	☐	☐	☐	☐	☐
45. I struggle to alter my view of myself as an overweight person.	☐	☐	☐	☐	☐
46. I notice the world's poor are asserting their rights to a greater share of the world's food supplies.	☐	☐	☐	☐	☐
47. I remove things from my home that remind me of eating.	☐	☐	☐	☐	☐
48. I take diet pills to help me lose weight	☐	☐	☐	☐	☐

PROS AND CONS

Each statement represents a thought that might occur to a person who is deciding whether or not to lose weight. Please indicate how IMPORTANT each of these statements might be to you if you were considering a decision to lose weight. There are FIVE possible responses to each of the items that reflect your answer to the question "How important would this be to you?" Please check the box that best describes how important each statement would be to you if you were deciding whether or not to lose weight

5 = Extremely important
4 = Very important
3 = Moderately important
2 = Slightly important
1 = Not important at all

	Not Imp. 1	Slight. Imp. 2	Mod. Imp. 3	Very Imp. 4	Extreme. Imp. 5
1. The exercises needed for me to lose weight would be a drudgery	☐	☐	☐	☐	☐
2. I would feel more optimistic if I lost weight	☐	☐	☐	☐	☐
3. I would be less productive in other areas if I was trying to lose weight.	☐	☐	☐	☐	☐
4. I would feel sexier if I lost weight	☐	☐	☐	☐	☐
5. In order to lose weight I would be forced to eat less appetizing foods.	☐	☐	☐	☐	☐
6. My self respect would be greater if I lost weight	☐	☐	☐	☐	☐
7. My dieting could make meal planning more difficult for my family or housemates.	☐	☐	☐	☐	☐
8. My family would be proud of me if lost weight.	☐	☐	☐	☐	☐
9. I would not be able to eat some of my favourite foods if I were trying to lose weight.	☐	☐	☐	☐	☐
10. I would be less self-conscious if I lost weight.	☐	☐	☐	☐	☐
11. Others would have more respect for me if I lost weight	☐	☐	☐	☐	☐

Continues over page

PROS AND CONS (Continued)

	Not Imp. 1	Slight. Imp. 2	Mod. Imp. 3	Very Imp. 4	Extreme. Imp. 5
12. Dieting would take the pleasure out of meals	☐	☐	☐	☐	☐
13 .I would have to cut down on some of my favourite activities if I try to lose weight.	☐	☐	☐	☐	☐
14. I could wear more attractive clothing if I lost weight.	☐	☐	☐	☐	☐
15. I would have to avoid some of my favourite places if I were trying to lose weight.	☐	☐	☐	☐	☐
16. My health would improve if I lost weight.	☐	☐	☐	☐	☐
17. Trying to lose weight could end up being expensive when everything is taken into account.	☐	☐	☐	☐	☐
18. I would feel more energetic if I lost weight.	☐	☐	☐	☐	☐
19. I would have to cut down on my favourite snacks while I was dieting.	☐	☐	☐	☐	☐
20. I would be able to accomplish more if I carried fewer pounds.	☐	☐	☐	☐	☐

CONFIDENCE

The next statements describe some typical eating situations. Everyone has situations which make it very hard for them to keep their weight down. The following are a number of situations relating to eating patterns and attitudes. Read each situation and decide how confident (or certain) you are that you will be able to resist eating in each of the difficult situations. In other words, pretend that you are in the eating situation right now. On a scale from 0 (not confident) to 9 (very confident) choose ONE number that best reflects how confident you feel about being able to successfully resist the desire to eat. Write this number down next to each item.

Not confident at all that you can resist the desire to eat — *Very confident that you can resist he desire to eat*

0 1 2 3 4 5 6 7 8 9

EXAMPLES:

I AM CONFIDENT THAT:	CONFIDENCE NUMBER
1. I can control my eating on weekends	8
2. I can say "No" to snacks	6

I AM CONFIDENT THAT:	CONFIDENCE NUMBER
1. I can resist eating when I am anxious (nervous).	
2. I can control my eating on the weekends.	
3. I can resist eating even when I have to say "no" to others.	
4. I can resist eating when I feel physically run down.	
5. I can resist eating when I am watching TV.	
6. I can resist eating when I am depressed (or down).	
7. I can resist eating when there are many different kinds of food available	
8. I can resist eating when I feel it is impolite to refuse a second helping	
9. I can resist eating even when I have a headache	

CONFIDENCE (Continued)

Not confident at all that you can resist the desire to eat

0 1 2 3 4 5 6 7 8 9

Very confident that you can resist the desire to eat

I AM CONFIDENT THAT:	CONFIDENCE NUMBER
10. I can resist eating when I am reading	_____
11. I can resist eating when I am angry (or irritable)	_____
12. I can resist eating even when I am at a party	_____
13. I can resist eating even when others are pressuring me to eat.	_____
14. I can resist eating when I am in pain.	_____
15. I can resist eating just before going to bed	_____
16. I can resist eating when I have experienced failure	_____
17. I can resist eating even when high-calorie foods are available	_____
18. I can resist eating even when I think others will be upset if I don't	_____
19. I can resist eating when I feel uncomfortable	_____
20. I can resist eating when I am happy	_____

End of Question Booklet

Thank you very much for answering these questions for us !
Please return them right away in your postage-paid envelope!

The next question booklet will be sent to you after Heart to Heart finishes and will only take you approximately 30 minutes to answer

Appendix O

Correlation Matrix for Variables in this Study
N = 152

	NNEO	LOT	BSI	MSIS	SE	POCbe	POCex	PROS	CONS
LOT Optimism	-.65**								
BSI Psychological Distress	..59**	-.51**							
MSIS Intimacy	-.27**	.19*	-.21*						
SE Self-Efficacy	-.25**	.19*	-.22*	.03					
POC-be Behavioural POC	.10	-.06	.04	-.28*	.07				
POC-ex Experiential POC	-.05	-.04	-.12	-.02	.10	.46**			
PROS "Pros" of Change	.24**	-.19*	.17*	-.10	.07	.36**	.08		
CONS "Cons" of Change	.28**	-.27**	.16	-.10	-.13	.29**	.12	.76**	
OUTCOME Prog. vs. Non-prog.	-.22*	.17*	.13	.38**	.15	-.25**	-.13	-.02	-.03.

Note
* $p < .05$ ** $p < .01$
Progressors coded as 1, Non-progressors coded as 2

Appendix P

Table of means and standard deviations of variables in this study

Variable	Progressors		Non-progressors		Total Sample	
	M	SD	M	SD	M	SD
Neuroticism	50.93	10.67	57.19	11.56	51.88	10.87
Optimism	50.96	9.65	46.53	11.06	50.01	10.00
Psychological Distress	39.86	2.18	40.69	3.11	40.00	2.40
Social Intimacy	51.77	9.08	41.93	10.70	50.00	10.00
Self-Efficacy	58.26	1.09	57.78	1.58	58.23	1.20
Pros of Change	59.70	.97	59.65	1.00	59.70	.94
Cons of Change	59.46	.99	59.39	1.34	59.45	1.03
Behavioural POC	48.66	9.87	55.05	9.29	49.94	10.00
Experiential POC	49.05	9.72	53.85	10.05	50.14	10.00

Appendix Q
Comparison of Male and Female Participants

Seventy five percent of the participants in this study were male (N = 117) and twenty five percent were female (N = 39), and equal proportions of males nd females dropped out of the study. Preliminary analyses were conducted to determine that there were no differences by gender on the major outcome variable (i.e., membership in the Progressing vs. Non-progressing group). Analyses were also conducted by gender on medical and demographic variables in addition to other characteristics of interest.

Chi-square analyses and t-tests were used to compare men and women for demographic variables (age, gender, level of education, occupation and marital status). No gender differences were found with the exception of age. Females were found to be significantly older than males ($t(153) = 2.3$, $p < .03$). This difference could be expected in a study of patients with coronary artery disease, because females tend to experience symptoms of this condition at a later age than do males (van der Schon, van der Graaf & Steyerberg, 1996).

Differences on medical variables (type of cardiac event, time since cardiac event and functional capacity) were investigated using analysis of variance (ANOVA) and chi-square tests. Significant differences for medical variables were found only for functional impairment. Men reported significantly greater

functional impairment than women (t (153) = 3.0, p = .003). This was not an expected difference.

Gender differences were also investigated for levels of psychological distress, neuroticism and dispositional optimism and intimacy, and also for the Transtheoretical variables (self-efficacy, decisional balance and change process-use). A significant difference was identified only for psychological distress, with male subjects scoring were significantly higher than female subjects (F (138) = 28.07, p >.01). A significant difference was also detected by gender in choice of target behaviour. Similar proportions of males and females chose to change exercise and smoking habits (exercise: 26 % males & 25 % of females; smoking: 15 % males & 13 % females). However, in the present sample a greater proportion of women chose weight reduction (27 % of females vs. 9 % of males) while a greater proportion of men chose reduction of dietary fat (50 % of males vs. 32 % of females) (χ^2 (3) 8.86, p < .05). It was argued that both of these choices require similar behaviours - control of eating habits. It is plausible that contemporary values might influence women to opt for weight reduction while men might more often choose to follow a low fat diet. Because gender was not a factor targeted specifically by the research hypotheses these differences were not expected to complicate further analyses or interpretations. Please refer to the table on the next two pages.

Descriptive Data and Significance Tests on Time 1 Demographic and Predictor Variables for Males and Females

		Males N = 117	Females N = 39	Statistic	Significance
Demographic	**Age**				
	Mean	55.1	59.6	t (153) = -.23	p = .03
	Standard Deviation	12.6	8.4		
	Marital status *(Percent)*				
	Single	4.3	7.9		
	Married/common law	85.3	73.7	χ^2 (3) = 7.59	NS
	Divorced/separated	7.8	5.3		
	Widowed	2.6	13.2		
	Level of Education *(Percent)*				
	High School	69.8	76.3	χ^2 (1) = .59	
	Post High School	30.2	23.7		NS
Medical Factors	**Cardiac Event** *(Percent)*				
	AMI	75.9	86.8		
	CABG	11.2	5.3	χ^2 (2) = 2.09	NS
	AMI & CABG	12.9	24.7		
	Time Since Event *(weeks)*				
	Mean	11.3	10.0	t (153) = .76	NS
	Standard Deviation	9.4	8.0		
	Functional Capacity *(DASI)*				
	Mean	23.5	16.4	t (153) = 2.95	p = .005
	Standard Deviation	12.5	13.0		
Health-risk Behaviour	**Target Behaviour**				
	Diet	50.0	32.4		
	Exercise	25.9	27.0	χ^2 (3) = 9.3	p = .04
	Weight	8.6	27.0		
	Smoking	15.5	13.5		
	Stage of Change				
	Precontemplation	.9	0		
	Contemplation	8.7	13.9		
	Preparation	17.4	13.9	χ^2 (4) = 1.97	NS
	Action	56.5	50.0		
	Maintenance	16.5	22.2		

Continued on next page.

Gender Differences Continued

		Males	Females	Statistic	Significance
Psychological Variables	**Psychological Distress** *(BSI)*				
	Mean	40.4	38.5	F (138)=28.07	p> .01
	Standard Deviation	2.1	2.6		
	Neuroticism *(NNEO)*				
	Mean	68.5	65.9	F (138) = .37	NS
	Standard Deviation	6.8	7.0		
	Dispositional Optimism *(LOT)*				
	Mean	33.4	34.83	F (138) = 4.86	NS
	Standard Deviation	10.2	9.21		
	Intimacy *(MSIS)*				
	Mean	49.4	51.8	F (138) = 3.44	NS
	Standard Deviation	9.9	10.2		
TTM Measures	**Pros of Change**				
	Mean	59.7	59.8	F (147) = .00	NS
	Standard Deviation				
	Cons of Change				
	Mean	59.4	59.7	F (147) = 1.1	NS
	Standard Deviation				
	Self-efficacy				
	Mean	58.3	58.1	F (147) = .85	NS
	Standard Deviation				
	Experiential POC				
	Mean	11.0	10.6	F (147) = .83	NS
	Standard Deviation	3.2	2.7		
	Behavioural POC				
	Mean	11.7	11.9	F (147) = .04	NS
	Standard Deviation	3.1	2.9		

HEART to HEART
A Program for Cardiac Patients and Their Partners

«Title» «Last»
«Address»
«Town» «Province»
«PostalCode»

Alison Lee
2-1029 Carling Avenue
Ottawa, Ontario
K1Y 4E8

1-800-797-0397

Date

Dear «Title» «Last»:

We received your completed question package - thank you for answering our questions. As promised, this questionnaire is not so long. In this package, the first set of questions pertain to your experience in *Heart to Heart* The rest you have answered before - please bear with us, there is a reason for this.

Again, thank you for participating in our study. We count on the help of recovering heart patients, like yourself, to show us how we can provide the best possible services. We hope you found *Heart to Heart* to be a useful experience, and wish you well in your recovery.

Please call me (toll-free) at 1-800-797-0397 if you have any questions regarding our study.

Alison Lee

PS We will mail you the final question package in October. It will be shorter than this one.

HEART AND STROKE FOUNDATION

HEART to HEART
A Program for Cardiac Patients and Their Partners

«Title» «First» «Last»
«Address»
«Town», «Province»
«PostalCode»

Alison Claire Lee
34, Liveoak Crescent
Nepean
Ontario K2J 1R6

Tel: 1-800-737-0973

Date

Dear «Title» «Last»,

Here is the third and final question package in our study. Again I would like to thank you, on behalf of the Heart and Stroke Foundation and myself, for taking part in this province-wide study. One hundred and fifty people from all parts of Ontario are now participating, and our results should be ready early in 1996. If you are interested, I will send you a copy of our findings.

With very best wishes,

Alison Lee

HEART AND STROKE FOUNDATION

PAR Psychological Assessment Resources, Inc.

Mailing Address: P.O. Box 998/Odessa, Florida 33556
Street Address: 16204 N. Florida Ave./Lutz, Florida 33549

Telephone (813) 968-3003
Telefax (813) 968-2598

June 20, 1994

Alison Claire Lee
2-1029 Carling Avenue
Ottawa Ontario K1Y 4E8
CANADA

Dear Ms. Lee:

In response to your recent request, permission is hereby granted to you to reproduce 150 copies of the 24 items from the Neuroticism and Conscientiousness Scales of the NEO Five Factor Inventory for use in your study of patients recovering from heart attack or heart surgery.

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Carnegie Mellon University

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FAX: (412) 268-7810
Internet: ms0a@andrew.cmu.edu

June 16, 1994

Ms. Alison Lee
2-1029 Carling Avenue
Ottawa, Ontario
K1Y 4E8 CANADA

Dear Ms. Lee:

You have my permission to reproduce and use the Life Orientation Test (LOT) for research purposes. I would appreciate your letting me know how your work turns out. If you have any questions, please feel free to call my secretary Susan Kravitz at 412-268-3791. Good luck.

Sincerely,

Michael F. Scheier, Ph.D.
Professor of Psychology

Cancer Prevention Research Consortium
University of Rhode Island ▲ The Miriam Hospital ▲ Brown University

Allison Lee
2-1029 Carling Ave.
Ottawa, Ontario K1Y4E8

3/24/94

Dear Ms. Lee,

Thank you for your interest in our work at the Cancer Prevention Research Center. At this point in time, our assessment inventories are available for **research purposes only**, rather than for clinical use. Dr. James O. Prochaska, our Director, is pleased to extend his permission for you to use the Transtheoretical Model measure(s) checked off for research purposes.

A copy of the measure(s) you requested and some relevant journal articles are enclosed. Please don't hesitate to contact us if we can help you further.

We continue to conduct research to improve the psychometric properties of our instruments. You can help us in these efforts by sending a copy of any of your published research reports to our Director of Research: Joseph S. Rossi, Ph.D.

Sincerely,
Susan R. Rossi
Susan R. Rossi, M.S.N., R.N. (ABD)
Post Doctoral Fellow

Articles sent:
7,25,18,22,916,72,4,70,52,53,3,26,190,270,604,921,35,183,71,911,28,927,217,924,925,601,189,186,185

Problem area
1x_Smoking __adolescents
2x_Weight Control
3x_Dietary Fat
4__Alcohol
5__Psychotherapy __9a client __9b therapist __9cwithin__9dbetween
6__Exercise
7__Sun Exposure
8__Cocaine
9__Aids
10___Psychic Distress
11___Mammography
12___Cervical Pap
13___HIV
14___Delinquents
15___Coping
16___PTSD
17___Academic performance
18___Head Trauma
19___Safer Sex
20___Back pain
21___Drug Use
22___Being in Therapy
23_x_Exercise

x_Stages of Change
__algorithm x_URICA

x_Processes of Change
__short form x_longform

x__Self Efficacy
x_Confidence __short formx_longform
x_Temptation __short formx_longform

x_Decisional Balance
__short form x_longform

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June 16, 1994

Dr R. Miller
2900 Steeles Avenue East
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Dear Dr Miller

Thank you for your telephone call this morning, and for giving me permission to use the MSIS in my study. My thesis is an attempt to derive a predictive model of factors that mediate behavioural risk factor modification in patients who have had a heart attack or heart surgery. The study sample (N = 110) will be drawn from patients attending a community-based cardiac rehabilitation program in Ontario.

I will be pleased to send you a copy of my results section, an event which I am hoping will occur sometime next Summer!

Yours sincerely,

Alison C. Lee